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AN ANALYSIS OF DETERMINANTS OF EDUCATION EXPENDITURES

AMONG THE PROVINCES OF CANADA

DECENNIALY, 1941 - 1961

by

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A DISSERTATION

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

DEPARTMENT OF EDUCATIONAL ADMINISTRATION

EDMONTON, ALBERTA

MARCH, 1967

UNIVERSITY OF ALBERTA
FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "An Analysis of Determinants of Education Expenditures Among the Provinces of Canada, Decennially, 1941 - 61" submitted by Ian Wilson Paterson in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

ACKNOWLEDGEMENTS

This dissertation was completed with the assistance and support of the Department of Educational Administration, University of Alberta, and a grant from the Canadian Education Association. Dr. G. L. Mowat and Dr. E. J. Hanson have been singularly generous in providing the writer with guidance and suggestions. The officers and staff of the Education and Census Divisions of the Dominion Bureau of Statistics, Ottawa, supported the writer with their files and advice. The typing of the study was intelligently and patiently completed by Mrs. M. Cox. Throughout the writing of the study, a very personal and particular assistance was afforded the author by his wife, Marjorie. To these various individuals and organizations, the writer offers sincere gratitude.

ABSTRACT

The central purpose of this study was an investigation of the factors which act as determinants of current expenditures per pupil in average daily attendance for public elementary and secondary education among the ten provinces of Canada, decennially 1941 - 1961.

A theoretical model of determinants of education expenditures was developed retroductively from the literature to provide the conceptual framework for the conduct of the empirical parts of the study. The model classified determinants into two major theoretical categories: Non-Policy or Socio-Economic determinants, and Policy or Political determinants. Non-Policy determinants were viewed as being less susceptible to short-run manipulation by policy-makers and as being essentially immanent characteristics of a community. In contrast, Policy determinants were viewed as being capable of short-run manipulation. This distinction provided a logical basis for separating statistically synonymous variables for the purposes of the empirical analyses.

The major empirical part of this study examined determinants of education expenditures with multivariate statistical techniques. The crucial Non-Policy determinant of levels of education expenditures was found to be levels of personal income per capita. The computation of income elasticities with respect to education expenditures produced elasticities that were generally less than one for the 1941 to 1961 period. The extent of income inequality, together with proportions of Roman Catholics and dependents in the population, were established

as additional significant determinants of levels of education expenditures. The empirical analyses of Policy determinants showed teacher salary levels and school sizes to be important determinants of levels of education expenditures. In addition, the proportion of enrolments beyond statutory leaving ages was found to be an important determinant.

Factor analyses of the clusters of determinants in each of the Non-Policy and Policy categories disclosed patterns of inter-relationships among these variables. In this manner it was possible to infer relationships between levels of education expenditures and clusters of related determinants.

The second empirical part of this study examined inter-provincial differences in levels of selected determinants of education expenditures with descriptive statistical techniques. The purpose of this analysis was an attempt to disclose sources of differences in provincial levels of education expenditures. In this regard, provincial expenditure levels were examined in their relation to levels of personal income per capita, to levels of income components, to teacher salary costs and to proportions of secondary school enrolments. The provincial levels in each of these indexes were found to be strongly related to provincial levels of education expenditures.

The study established the utility of a multivariate statistical analysis of education expenditure determinants among the ten provinces of Canada. It revealed, however, an approach which needs to be applied at the school-system level to establish a more particular

validity. In this application, initial attention to the evident clustering of related determinants as revealed by factor analyses would be valuable.

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CHAPTER I

THE OBJECTIVES AND SIGNIFICANCE OF THE STUDY

During recent years there has been an increasing interest in the role of education in the national economy. One aspect of this interest has been the production of theoretical and empirical studies which seek to determine specific relationships between education expenditures and selected socio-economic factors. Several of these studies have used multivariate statistical techniques, applied to data from the United States, as a means of identifying and estimating the effect of specific independent variables on the variance of education expenditures.¹ These techniques provide more powerful tools for the study of such relationships than earlier studies were able to command. In no instance has Canadian data been subjected to a similar analysis.

THE OBJECTIVES OF THE STUDY

Statement of Objectives

The purpose of this study is to investigate the factors which act as determinants of current expenditures per pupil in average daily attendance for public elementary and secondary education among the provinces of Canada. The study seeks to identify specific factors which are associated with different levels of education expenditures made by the

¹See, for example, Jerry Miner, *Social and Economic Factors in Spending for Public Education* (Syracuse: University Press, 1963) and, Sherman Shapiro, *An Analysis of the Determinants of Current Public and Societal Expenditure per Pupil in Elementary and Secondary Schools* (unpublished doctoral dissertation, The University of Chicago, 1962).

provinces through the use of multivariate statistical techniques. Prior to the empirical analyses, a theoretical model of determinants of education expenditures is developed. The model is designed to form a conceptual framework within which previous studies associated with education expenditures may be viewed. A particular purpose of the model is the identification of major theoretical determinants of public education expenditures, providing a basis for the evaluation of their influences in the subsequent empirical analyses.

The empirical analysis is undertaken in two distinct parts. The first is concerned with an examination of the ability of various sets of independent variables, which have been identified by the model, to explain the variation in education expenditures, together with an analysis of the importance of these variables taken separately. In terms of these results, the second part of the empirical analysis examines the apparent sources of differences in public education expenditures among the provinces of Canada.

This study may be considered as an heuristic exercise in the area of public expenditures for education. Its goal is simply to add to our knowledge of the forces that make for education expenditure variations in Canada.

Delineation of the Study

The study is restricted to a consideration of education expenditures at one level of government, the provincial level. It is recognized that basic decisions regarding education expenditures are made at the local government level, and that there are significant differences

in expenditures among local areas within any one province. By restricting the study to an examination of provincial data, it is understood that these data simply represent averages of the specific data of individual school systems. The position adopted in this study is that the provincial governments bear the responsibility for equalization procedures within their areas, while the federal government is deemed to bear ultimate responsibility for equalization among the provinces. The direction of the study is towards examination of inter-provincial, rather than intra-provincial, variations in public education expenditures.

The study is further limited by considering only expenditures for public elementary and secondary education. No account is taken of public expenditures for technical, higher, adult, or pre-school educations and related cultural activities. Expenditures for private elementary and secondary education are similarly omitted.

In consideration of the availability of detailed census reports, and the inherent difficulties associated with a base year too far removed in time, the study is limited to three decennial periods: 1941, 1951, and 1961. The units of analysis are calendar-year data. Where school-year data are involved, adjustments are made to a calendar-year basis.

Data Sources and Methods

The approach is through a series of cross-section analyses of the three decennial periods. As each of these years was a census year in Canada, authoritative data collection was facilitated. A large portion of the data has as its source the decennial *Census of Canada* reports, together with relevant reports from the Education Division of the Dominion

Bureau of Statistics. Part of the data has as its source the Annual Reports of provincial Departments of Education. Whatever weaknesses are intrinsic to these sources of data are carried over into the study. It is possible that expanded variables derived from these data sources may be in error, and the responsibility for such error rests entirely with the author of this study.

The empirical analyses make extensive use of multivariate regression techniques. Factor analyses are also used as a means of examining the inter-relationships among the independent variables. In the discussion of major findings produced by these multivariate techniques, provincial variations in selected variables are described in terms of percentages of the national means.

SIGNIFICANCE OF THE STUDY

Size and Variability of Provincial Education Expenditures

In 1965 an estimated \$2,316 million was spent on public elementary and secondary education by all levels of government in Canada.² With the exception of an estimated \$121 million provided from federal funds directly, the necessary funds to support this level of education spending came from provincial and local governments. About one half of the total outlay was spent on teachers' salaries, twenty-eight per cent was for capital and debt service outlays, and the remainder for non-teaching expenses. Total expenditures for public elementary and secondary

²Dominion Bureau of Statistics (hereafter shortened to D.B.S.), *Preliminary Statistics of Elementary and Secondary Education* (Ottawa: Queen's Printer, 1965), pp. 44 - 45.

education constituted over seventeen per cent of the \$13,000 million spent by all levels of government for all services in 1962. This proportion for education expenditures represented the largest share of all public expenditure categories.

Among the provinces there is a wide variation in education expenditures which cannot be simply accounted for by population differences. Table I shows the average national education expenditure per pupil in 1964-65 as an estimated \$337. About this mean the variation ranged from \$144 in Newfoundland to \$406 in Alberta. These disparities have been investigated by others, largely with relatively simple statistical techniques that are not capable of demonstrating the relative importance and systematic influence of related socio-economic factors.³ The present study is intended to provide a contribution towards filling this knowledge gap in Canada.

Roles of Different Levels of Government

There has long been a strong similarity between the United States and Canada regarding the roles of different levels of government in the financing and control of public elementary and secondary education. In most major areas American experience has strongly influenced Canadian practice. Whereas the American states won the right to control education, in a sense, by default from their Federal Government, the Canadian *British North America Act* specifically delegated responsibility for education to

³For example, Kenneth F. Argue, *Financing Education in the Canadian Provinces* (Ottawa: Canadian Teachers' Federation, 1941); M. E. LaZerte, *School Finance in Canada* (Ottawa: Canadian School Trustees' Association, 1955); and John E. Cheal, *Investment in Canadian Youth* (Toronto: Mac-Millan Company of Canada, 1963).

TABLE I
TOTAL EXPENDITURES PER PUPIL FOR PUBLIC ELEMENTARY
AND SECONDARY EDUCATION, BY PROVINCES
1964-65
(Current dollars)

Province	Per Pupil ^a
Alberta	406
Ontario	384
British Columbia	375
Saskatchewan	372
Canada ^b	337
Manitoba	326
Quebec	293
Nova Scotia	274
New Brunswick	243
Prince Edward Island	202
Newfoundland	144

^aPer pupil in average daily attendance.

^bExcluding the North-West Territories and Yukon.

Source: D.B.S., *Preliminary Statistics of Education, 1964-65*
(Ottawa: Queen's Printer, 1965), Table 20.

the provinces. In turn, both the states and the provinces handed down to their subordinate local school district governments the responsibility for operating schools.

Wide differences in ability to support education became evident among the local school district governments, particularly with the growth of urbanization. Research studies illustrated the local government differences and explained the necessity for measures of state support. The establishment of foundation and minimum programmes based on forms of state financial support accented two salient assumptions. The first of these was that the states were individually homogeneous entities, being made up of interrelated local districts at least insofar as education was concerned. Secondly, each state was held generally accountable for securing a minimum education pattern, based on its own standards, within all its local school districts.

These features are illustrated in several of Mort's conclusions from his 1933 research:

The task ahead is not to bring all states into the same pattern of practice. It is rather to have each sovereign state accept responsibility for meeting attainable standards acceptable to its own people and for meeting these standards in ways which are in harmony with their thinking.

(5) The system of supporting public schools largely by local taxes began to break down more than half a century ago . . . due to increase in the cost of education arising from a more complex civilization and to the development of extreme differences in ability to pay among communities.⁴

Having secured statewide minimum educational programmes, disparities among the states in ability to support schools became evident.

⁴Paul R. Mort, *State Support for Public Education* (Washington: American Council on Education, 1933), pp. 3 - 4.

Again, research studies illustrated the differences, projecting their investigations beyond local units to state aggregates. As early as 1937 John and Margaret Norton stated that,

adequate educational opportunities cannot be provided for all American children by exhorting states . . . which do not now provide acceptable education facilities to make greater financial effort. [Because] these states, generally, are already making a greater effort to pay for the education of their children than does the country as a whole. They devote a larger proportion of their meagre income to the financing of schools than do the economically favored states.⁵

Further, they proposed,

. . . a primary purpose of federal aid should be the establishment of an acceptable minimum program of financial support for education in all states. This is recognized as a prerequisite to removal of gross inequalities of educational opportunities which now threaten national well-being.⁶

These proposals threatened the historic accord between the state and federal governments regarding responsibility for public elementary and secondary education. It was not until 1965 that the notion was given some substance in the enactment of the *Elementary and Secondary Education Act* by the Federal Government of the United States. In Canada, the issue of federal aid has remained at the pregnant academic stage. One reason for this has been indicated by Moffatt, whose comment, made in 1957, continues to be applicable:

. . . we need first of all more reliable information on the financing of our schools and on public finances in general. Much of this information must come from research, conducted in Canada and applied to Canadian conditions. Nearly all the research quoted or referred to in these lectures has been conducted in the United

⁵ John K. Norton and Margaret A. Norton, *Wealth, Education, and Children* (New York: Teachers' College, 1938), pp. 76 - 77.

⁶ *Ibid.*, p. 84.

States. While conditions may not be very different, and while the conclusions reached may be very much the same, the fact that the research uses our own data will make its findings much more convincing.⁷

The Role of Educational Administrators

In the final analysis decisions about public expenditures for education are taken politically and are, therefore, subject to influence through the ballot box or by whatever means interested people use to bring pressure upon the political mechanism of government. More precisely, the actual allocations for education expenditures are made through the political mechanisms of the budgetary process. The most consistent and important factor determining the size and content of one year's budget is the budget of the previous year.⁸

Yet increases and variations in the levels of expenditures are strongly influenced by the actions of educational policy-makers. Whatever calculative devices participants in the budgetary process resort to, and whatever the rule of expediency in budgetary decisions, it remains true that the impetus and pressure for increased expenditures arise from some one or more influential persons. Often these influential persons are simply the visible elected representatives serving on school boards and in provincial legislatures. But behind these visible representatives there is invariably a history of diverse influential forces composed of less visible persons and groups.⁹ It would be expected

⁷H. P. Moffatt, *Educational Finance in Canada* (Toronto: W. J. Gage, 1957), pp. 89 - 90.

⁸Aaron Wildavsky, *The Politics of the Budgetary Process* (Boston: Little, Brown, 1964), p. 13.

⁹See, for example, Neal Gross, *Who Runs Our Schools?* (New York: John Wiley, 1958).

that professionals in the field of education would form part of these influential forces. In particular, professional educational administrators would be expected to exert influence since it is one of the tasks of educational administrators to delineate and interpret educational goals and requirements.

The formulation of any consistent policy by educational administrators requires forecasting of future developments. The formulation of viable policy also requires an understanding of the contemporary climate of opinion. If it can be shown that valid generalizations can be made about the association of singular socio-economic and political factors with varying levels of education expenditures, then more satisfactory appraisals of expenditure policies should be possible. If it can be shown that the contemporary climate of opinion, as manifested in per pupil education expenditures, is related to specific socio-economic factors immanent to the community, then knowledge of these relationships should enhance the efficiency of educational administrators both in policy-making and influence activities relating to the finance of education.

SUMMARY

This study is concerned with an analysis of determinants of public elementary and secondary education expenditures per pupil in average daily attendance¹⁰ among the provinces of Canada. The approach is

¹⁰ Average daily attendance, hereafter referred to as A.D.A.

through a series of three cross-section analyses in 1941, 1951, and 1961. Multivariate statistical techniques form the basis of the empirical investigation which is based upon major determinants of education expenditures revealed in a theoretical model. The findings of the multivariate analyses applied to Canada as a whole are then used in the examination of inter-provincial differences in per pupil education expenditures.

The study is important for several reasons. First, provincial school expenditures show considerable variation. It is important that these variations be explained, particularly to determine the relationships between socio-economic factors and levels of education expenditures. Secondly, an understanding of the major factors at work to determine the magnitude of education expenditures is important for educational administrators seeking increased support from public funds. Thirdly, the study should prove useful in extending our understanding of inter-provincial differences in public education expenditures. Proponents of federal aid, as a means of rectifying these differences, should find in this study a fruitful source of data. Finally, this study is the first attempt to apply multivariate statistical techniques to Canadian data related to levels of education expenditures.

Chapter II develops the theoretical model for use in this study, following a survey of the literature relevant to this purpose. Chapter III presents the empirical model and explains the variables and techniques used in the analyses. Chapter IV presents the findings of the first part of the empirical analysis: the combined analysis of all

provinces; while Chapter V presents the findings of the second part: the analysis of inter-provincial differences. Chapter VI is the conclusion. In Appendix A there are additional statistical tables relevant to the analyses of Chapter IV, and in Appendix B there are reference tables, including one for each of the variables used in this study.

CHAPTER II

FORMULATION OF A THEORETICAL MODEL

The particular purpose of this chapter is to offer a theoretical model of public expenditures for education against which the empirical phase of this study may be cast. The genesis of the model rests, in part, on the findings of previous research studies. Hence, the initial section of this chapter is devoted to brief reviews of salient features of the related studies. The approach to the formulation of the theoretical model is "prescriptive" in the sense that it is developed without regard to the feasibility of data collection. Hence, the model is "prescriptive" in terms of input variables rather than in the usual sense of the term, as indicative of an ideal-type output.

STUDIES OF DETERMINANTS OF EDUCATION EXPENDITURES

The usual procedure, in studying the determinants of education expenditures, is to relate a number of socio-economic and educational characteristics of communities¹ to levels of education expenditures. Earlier studies worked largely with simple statistical techniques, including simple correlations. Recently, the use of multivariate statistical techniques has facilitated more precise estimations of relationships, particularly of the influence of groups of factors, or of single factors, with other factors being taken into account. Thorough reviews of major empirical studies relating to determinants of education

¹"Communities" at any one of three levels of government: school district, state/provincial, or federal.

expenditures have been given in recent studies by Miner² and Shapiro³. In this section, the highlights of post-1945 empirical studies are given to provide a perspective within which to view the techniques and findings of this study.

Studies of Per Pupil Education Expenditures

Hirsch, in his *Analysis of the Rising Costs of Public Education*⁴ between 1900 and 1958, outlined a model of determinants of education expenditures from which he derived specific variables to be included in a multiple regression time series analysis. The variables, reflecting major categories of his model, were six in number. The dependent variable was daily total current expenditures plus debt service per pupil in A.D.A. for public elementary and secondary schools, reflecting population size. The independent variables included: proportion of high school enrolment relative to total enrolment and proportion of pupils in A.D.A. living in urban areas, reflecting sociological characteristics of the population; average annual salary per instructional staff member and personal income per capita, reflecting economic characteristics of the population; and number of supervisory and auxiliary personnel per one thousand pupils in A.D.A., reflecting variety, scope, and quality of educational services. His two remaining theoretical categories,

²Jerry Miner, *Social and Economic Factors in Spending for Public Education* (Syracuse: Syracuse University Press, 1963), Chapter III.

³Sherman Shapiro, *An Analysis of the Determinants of Current Public and Societal Expenditure Per Pupil in Elementary and Secondary Schools* (unpublished doctoral dissertation, University of Chicago, 1962), Chapter II.

⁴Werner Z. Hirsch, *Analysis of the Rising Costs of Public Education* (Washington: Joint Economic Committee, 1959).

productivity of schools and aspects of government responsibility, were not explored. The results indicated that only the personal income and teacher salary variables were statistically significant in the multiple regression, and these two variables correlated .97 with each other. Hirsch noted that 76 per cent of the variation in levels of education expenditures between 1900 and 1958 could be explained by personal income per capita changes, holding the effects of changes in urbanization and high school enrolment proportions constant.

Hirsch later applied a similar technique to the study of per pupil education expenditures in 26 school districts of St. Louis County between 1951-2 and 1954-5.⁵ While the dependent variable was identical to that of his larger study, the independent variables were different. Of six independent variables used, only three were statistically significant in the multiple regression, although all six together explained 82 per cent of the variance in levels of education expenditures. The three significant variables were: proportion of high school pupils in A.D.A. relative to total A.D.A., average assessed real property valuation per pupil, and an index of scope and quality of educational services. The index was comprised of six factors: number of teachers per 100 pupils, average number of college credits per teacher, average teacher salary, percentage of teachers with 10 or more years of experience, number of high school credit courses, and percentage of high school students entering college. The three other variables included

⁵Werner Z. Hirsch, "Determinants of Public Education Expenditures," *National Tax Journal*, Vol. XIII (March, 1960), pp. 29 - 40.

number of pupils in A.D.A., number of pupils in A.D.A. per square mile, and percentage increase in A.D.A. between 1951-56.

Renshaw investigated relationships with state education expenditures per pupil in A.D.A. in 1949-50, and found that state aid per pupil, state income per capita, and percentage of non-white population together accounted for 65 per cent of the variance in education expenditures in a multiple regression.⁶ Renshaw noted that per capita income of itself explained almost 78 per cent of the variance in levels of state education expenditures.

Shapiro examined determinants of current public education expenditures per pupil in A.D.A. for elementary and secondary schools in a series of cross-section analyses for 1920, 1930, 1940, and 1950 for the American states.⁷ Shapiro performed a series of multiple regressions, with up to eleven socio-economic independent variables, before reaching the final phase in which four specific independent variables together with a regional "dummy" variable were used. In the final regressions, personal income per capita, percentage of the labour force in non-agricultural employment, percentage of children aged 5 to 17 enrolled, and percentage of total enrolment in public high schools together accounted for between 45 and 70 per cent of the variance in levels of education expenditures in the United States, decennially, 1920 to 1950. Shapiro noted that "the results of the study confirm the view that income

⁶Edward F. Renshaw, "A Note on the Expenditure Effect of State Aid to Education," *Journal of Political Economy*, Vol. LXVIII (April, 1960), pp. 170 - 174.

⁷Shapiro, *op. cit.*

is the dominant force in the determination of expenditures for education."⁸ The independent variables found to be unimportant in the multiple regressions included percentage of population non-white, nonpublic enrolment as a percentage of total enrolment, percentage of population aged 5 to 17, and percentage of population living in urban places.

Miner computed two multiple regressions for total (state plus local) current expenditures per pupil and local current expenditures per pupil in elementary and secondary schools with up to twenty independent variables, among 80 school systems of 300 pupils and more in each of 23 states in 1959 — 1960.⁹ The twenty independent variables were chosen as reflective of demand and supply elements for education services, and of legal differences among states in their revenue and aid systems. While the overall multiple regression coefficients were relatively small (.735 for total expenditures and .780 for local expenditures), one variable, number of full-time employees in auxiliary services per pupil, emerged as the dominant determinant of levels of both total and local education expenditures. State personal income per capita showed no systematic effect on total expenditures but a strong negative effect on levels of local expenditures. The proportions of families with incomes of \$10,000 or more was positively associated with levels of expenditures in both categories as was the proportion of pupils in secondary grades. The findings further indicated that fiscally dependent school systems tend to spend less and that total expenditures are affected more by this variable than local expenditures. In terms of

⁸*Ibid.*, p. 75.

⁹Miner, *op. cit.*

variations in state aid patterns, Miner found higher per pupil expenditures were associated with those states that made more use of general-purpose rather than specific grants, and that local expenditures tend to be lower where equalization grants are used more extensively.

Studies of Per Capita Education Expenditures

Fabricant¹⁰ and Fisher¹¹, using data from the 1942 and 1957 United States *Census of Governments* respectively, investigated the relationships between state education expenditures per capita and three socio-economic factors using multiple regression analyses. The three factors were: personal income per capita, density (population per square mile), and urbanization (population centres of 2,500 or more). Together these factors accounted for 58 per cent of the variance in education expenditures in 1942 and 63 per cent in 1957. In general, higher densities and per capita incomes, with urbanization in 1957, were associated with higher levels of education expenditures.

Miner¹², in the study cited previously, also computed multiple regressions for the two dependent variables, total and local education expenditures, expressed on a per capita basis. The overall multiple regression coefficients were lower than those obtained for the per pupil dependent variables: .558 for total, and .689 for local expenditures

¹⁰Solomon Fabricant, *The Trend of Government Activity in the United States since 1900* (New York: National Bureau of Economic Research, 1952).

¹¹Glenn W. Fisher, "Determinants of State and Local Government Expenditures: A Preliminary Analysis," *National Tax Journal*, Vol. XIV. (December, 1961), pp. 349 - 355.

¹²Miner, *op. cit.*

per capita. In this analysis, the dominant determinant of levels of total expenditures per capita was found to be state per capita personal income. Noting that this variable had a much less pronounced effect on local per capita expenditure levels, Miner suggested that this was indicative of the effect of state aid acting to reduce the effect of local income variations. Further, it was found that as the proportion of revenues for local schools collected from state sources increased, total expenditures per capita were higher.

Brazer examined the determinants of current education expenditures per capita in 40 large cities in the United States in 1949, as part of a larger study of city expenditures.¹³ Median family income was found to be the most important determinant of levels of education expenditures, while intergovernmental revenue per capita and number of pupils in A.D.A. per 1000 of population were strong positive influences. Density of population, together with employment per 100 of population in manufacturing, trade and services, were not significant influences on levels of education spending.

Studies of Income Elasticities

Since variations in income levels are invariably associated with differences in levels of education expenditures, most authors have computed the income elasticity of demand for education. Income elasticity is the percentage change in expenditures associated with a one per cent change in income. While the various income elasticities are not

¹³Harvey E. Brazer, *City Expenditures in the United States* (New York: National Bureau of Economic Research, 1959).

directly comparable because of differences in definitions and periods covered, the results are indicative of general relationships between income and education expenditure changes.

Hirsch computed the national income elasticity of education to be 1.09 for the period 1900 to 1958.¹⁴ The computation was made on the results of his regression analysis using daily total education expenditures plus debt service per pupil in A.D.A. for public elementary and secondary schools and personal income per capita. Brazer found the income elasticity of education expenditures for 40 large cities in 1949 to be .729, using median family income and per capita current education expenditures.¹⁵ Fabricant, working with 48 states, personal income per capita, and current education expenditures per capita, computed an income elasticity of .78.¹⁶ Shapiro calculated the following elasticities with personal income per capita and current expenditures per pupil in A.D.A.: .998 in 1920, .720 in 1930, .712 in 1940, and .911 in 1950.¹⁷ Miner estimated income elasticities of current expenditures for local schools and state personal income per capita as 1.15 for total education expenditures per capita, .34 for local education expenditures per capita, .23 for total education expenditures per pupil, and -.82 for total education expenditures per pupil.¹⁸

¹⁴Hirsch, *Analysis of the Rising Costs of Public Education*, p. 36.

¹⁵Brazer, *op. cit.*, p. 58. ¹⁶Fabricant, *op. cit.*, p. 125.

¹⁷Shapiro, *op. cit.*, p. 69. ¹⁸Miner, *op. cit.*, p. 107.

McLoone calculated income elasticity on the basis of a simple regression between current education expenditures per pupil in A.D.A. and personal income per capita. From 1929-30 to 1957-58, the national income elasticity of education was .99, but the 1943-44 to 1957-58 period produced a national income elasticity of 1.61. More recently, the national income elasticity from 1947-48 to 1957-58 declined to 1.34, with three states below 1.0 and three above 2.0.¹⁹

No systematic attempt has been made to compute income elasticities of demand for education in Canada.

Comparison of Studies

The several studies noted previously cannot be compared directly since each of their designs is unique. Differences in the selection and definition of variables used and in the nature of the sample preclude an overall interpretation of the findings. In general, the studies attribute most of the variation in levels of education expenditures for public elementary and secondary schools to differences in income, property valuations, state aid systems, proportion of pupils in high school and proportion of pupils relative to population.²⁰

Few of the studies attempt construction of a theoretical framework to guide the selection of variables for the empirical phases of the studies. No study manages to resolve the statistical similarity between measures reflecting a community's ability (for example, personal income per capita) and measures reflecting the level of that community's

¹⁹Eugene P. McLoone, *Effects of Tax Elasticity on the Financial Support of Education* (unpublished doctoral dissertation, University of Illinois, 1961) cited by Miner, *op. cit.*, pp. 50 - 51.

²⁰Miner, *op. cit.*, p. 65.

educational services (for example, teacher salaries). Although such measures are logically distinct, the fact that they invariably correlate highly with each other forces singular emphasis on the ability measure as the most important determinant of levels of education expenditures. The present study seeks a resolution of this difficulty through the development of a theoretical framework within which to conduct the empirical phase of this study.

THEORETICAL APPROACHES TO THE STUDY

OF DETERMINANTS OF EDUCATION EXPENDITURES

In the particular area of public expenditures for education there has been scant use of economic models, or even of any type of logically developed model to act as a guide for the selection of variables as determinants of public expenditures. Principally, the variables used have largely derived from previous studies, from common-sense, and from attention to the types of statistical techniques to be performed.²¹ Implicit in all these studies, however, is the assumption that public education expenditures are in some measure "determined" by changing characteristics of communities. This assumption derives from the work of Adolph Wagner.

Wagner and the Concept of Determinants

The idea that public expenditures are in some measure "determined" by particular socio-economic factors derives from Adolph Wagner's

²¹*Ibid.*, p. 67.

proposition that the rate of growth of public expenditures would be faster than the rate of growth of community output. Wagner wrote,

The law [of increasing state activity] is the result of empirical observation in progressive countries, at least in Western European civilization; its explanation, justification and cause is the pressure of social progress and the resulting changes in the relative spheres of private and public economy, especially compulsory public economy. Financial stringency may hamper the expansion of state activities, causing their extent to be conditioned by revenue rather than the other way around, which is more usual. But in the long run the desire for development of a progressive people will always overcome these financial difficulties.²²

In effect, there are particular socio-economic forces, exhibiting relatively systematic changes, at work to "determine" the growth rates of public expenditures. It is this general assertion that has promoted search for the precise factors that act as influences upon public expenditures.

The purpose of such a search is to uncover patterns among influencing factors from which useful generalizations may be drawn. In the final analysis, it is certain that decisions about the extent and nature of public expenditures for education are taken politically. These decisions are influenced by individuals and groups through the mechanisms of voting and pressure strategies. Further, such decisions are dependent upon currently accepted ideas about the role of government in society.

In large measure the behaviour of governments with regard to expenditures is conditioned by revenues available. Political choice, as Peacock and Wiseman point out, is quite different from market choice:

It is inherent in the nature of choices made through the political process that the ideas of citizens as to what is desirable public

²²Adolph Wagner, cited in Alan T. Peacock and Jack Wiseman, *The Growth of Public Expenditure in the United Kingdom* (Princeton: National Bureau of Economic Research, 1961), p. 17.

expenditure can be separated from the ideas of those same citizens as to the reasonable burden of taxation.²³

Hence, while both citizens and government may realize the desirability of increased public expenditures, the execution of additional spending²⁴ may well founder against those same citizens' views of tolerable taxation burdens.

Irrespective of political considerations, however, there are certain socio-economic factors which seem to act as relatively permanent influences upon levels of government expenditures. The literature on such determinants, mainly in the area of general public expenditures, indicates the following major factors acting as determinants: (1) population characteristics, particularly changes in size and age composition; (2) urbanization levels; (3) economic development with its attendant price and income changes; and (4) tradition, especially the historical annealment of citizens' expectations of the level of public activity and taxation structures. These examples in no way exhaust the possible general influences. Even the influences mentioned differ in importance and effect over time and within singular economies in a given period of time. The diversity and complexity of these general influences is recognized.

²³ Alan T. Peacock and Jack Wiseman, *The Growth of Public Expenditure in the United Kingdom* (Princeton: National Bureau of Economic Research, 1961), p. 26.

²⁴ Additional spending, that is beyond the levels concomitant with rising revenues in consequence of increasing output per head.

Theories of Public Expenditures for Education

Miner experimented with an economic model of public expenditures for education developed on the principles of the welfare school. This school derives from attempts to apply the techniques of market analysis to public expenditures. In consequence, a government is considered as either an aggregate of individual choices or a unitary being which reacts in similar ways to an individual consumer. Miner established criteria for economically optimum levels of education expenditures in a consumer directed economy.²⁵ While he transposed his normative theory into a positive structure for the purpose of empirical analysis, he found that "the model as a whole does not have great explanatory power" when applied to the determinants of education expenditures.²⁶

Richard Stone formulated an econometric model of the educational system for the purpose of predicting future levels of education activity. His purpose was to provide mathematically-determined future needs as a guide for the necessity and planning of present investment in education, in terms of teacher training, buildings, supplies, and equipment.²⁷ Stone's model represents an entirely different approach and purpose to that envisaged in this study, but is illustrative of the econometric approach.

²⁵Miner, *op. cit.*, p. 139.

²⁶*Ibid.*, p. 136.

²⁷Richard Stone, "A Model of the Educational System," *Minerva*, Vol. 3 (Winter, 1965), pp. 172 - 186.

Mort and his associates have developed a model that focuses on the determinants of school quality, the Sequential Simplex.²⁸ The instrument used by Mort for measuring "quality" is the Elementary Growing Edge Scale. Hence, "quality" is conceived as a school system's ability to take on new practices and adapt to changing conditions. In an attempt to control the "great complex of factors related to school quality,"²⁹ Mort grouped identifiable factors according to the degree of their remoteness in effect upon school quality. In this manner a number of factors were identified in sequential relationship.

The general conception of the model is illustrated in Figure 1. It will be observed that the model indicates a flow sequence, with consequent implications of causality, from factors relating to community resources to expenditure level, from expenditure level to budgetary allotments such as salaries, from budgetary allotments to the character of the staff, and from character of the staff to quality.

An adaptation of the Sequential Simplex has been applied at state, rather than school system, levels after adjustments were made for regional cost variations.³⁰ In this adaptation, the Associated Public School Systems Time Scale was substituted for the Growing Edge as the measure of quality. The new instrument was again concerned with

²⁸Paul R. Mort and Orlando F. Furno, *Theory and Synthesis of a Sequential Simplex* (New York: Teachers' College, Columbia University, 1960).

²⁹Paul R. Mort, "School and Community Relationships to School Quality," *Teachers' College Record*, Vol. 55 (January, 1954), p. 202.

³⁰Austin D. Swanson, *Effective Administration Strategy* (New York: Teachers' College, Columbia University, 1961).

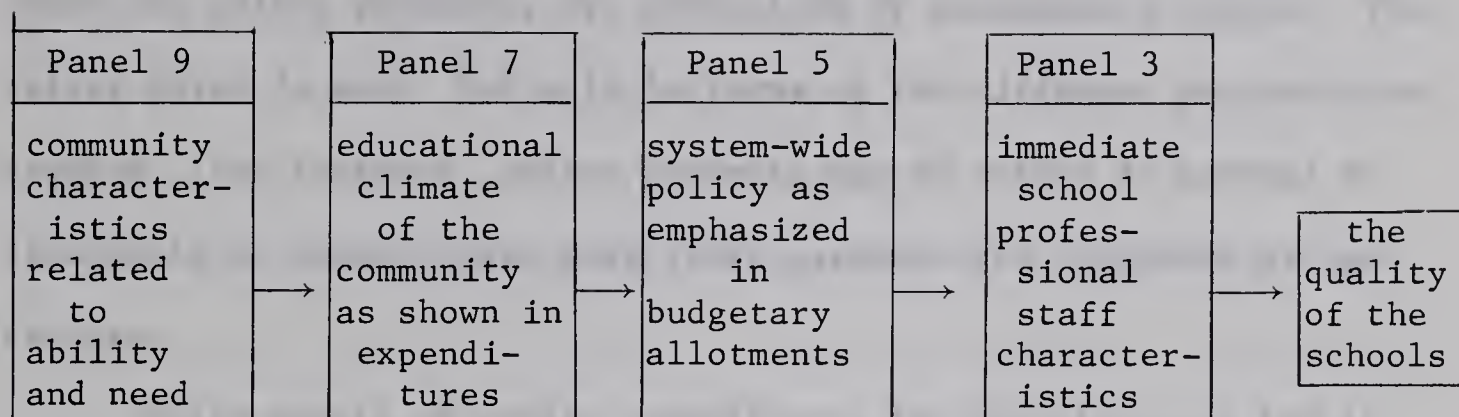


Figure 1. An abbreviated diagram of the Sequential Simplex. (Source: Paul R. Mort, "School and Community Relationships to School Quality," *Teachers' College Record*, Vol. 55, [January, 1954], p. 204.)

adaptability as indicative of quality.

Relevant to the purposes of this study, the interesting feature of each of these uses of the Sequential Simplex model is that the Panel 9 factors are clearly construed as determinants of the Panel 7 factors which include, most importantly, current expenditures. Again, the measure of current expenditures in Panel 7 is partly causative of average salary, which appears in Panel 5.

Investigation of the Panel 9 factors, apparent determinants of current expenditures, reveals that they are composed of measures of community wealth and measures of attitudes to education reflected in certain social characteristics of the community. These latter measures include percentages of college graduates, unskilled workers, and home owners in the population. The logic of the Sequential Simplex

rests in part upon the assumption that revenues effect expenditures, with the further implication that budgetary allotments, specifically those for salary payments, are determined by expenditure levels. The latter point is moot, but only in terms of the different perspectives adopted. For instance, salary payments may be viewed as partial determinants of expenditures when these payments are conceived as cost factors.

While models of public expenditures for education are few in number and designed for singular purposes, the Sequential Simplex model offers pertinent insights for the announced purposes of the present study. It has the further advantage of being explanatory in design rather than normative.

FORMULATION OF A MODEL OF DETERMINANTS OF PUBLIC EDUCATION EXPENDITURES

The Purposes of Model-Building

The particular purpose of this chapter is the development of a theoretical model of determinants of public expenditures for education. The use of the term "theoretical model" is purposive since it describes the singular intent of this study.

Maccia has defined a model as, "an object or characteristics used either to represent or to be represented."³¹ Further, she has suggested that the theory model approach is retroductive (insightful)

³¹Elizabeth Steiner Maccia, *The Model in Theorizing and Research*, Occasional Paper 65-180 (Ohio State University: Bureau of Educational Research and Service, 1965), p. 4.

rather than reductive or deductive, and "in forming the theory model, elements from theory are arranged and selected."³² In these terms, the proposed theoretical model in this study is representative of a relational structure in the phenomena, and it is retroductively formulated upon selected aspects of prior studies.

A function of the theoretical model is to delineate the problem area and so prepare the way for subsequent empirical investigations. Since theoretical models are devices for focussing attention, it is irrelevant to consider them as true or false. Rather, different models may be considered sterile or fruitful according to the extent to which their singular directions concur with a particular need or interest. More precisely, the fruitfulness of theoretical models lies in their predictive and explanatory powers when related to empirical data. A formulation of logical theoretical structure is particularly important in an investigation involving correlation techniques so that implications of cause and effect, rather than mere associative relationships, may be drawn.³³

For these several reasons there will be developed a theoretical model of determinants of public education expenditures. The formulation of the theoretical model is, in the words of Knezevich,

The description of events and their relationships . . . that attempts to predict what will happen in the real world. The model is . . . a symbolic expression of the theorist's conceptual

³²*Ibid.*, p. 11.

³³Miner, *op. cit.*, p. 37.

framework in a given area. 'Building a model' means much the same as 'constructing a theory'.³⁴

The Suggested Theoretical Model

Earlier studies of school expenditures used the concepts of Need, Ability, and Effort. These generic concepts provided a neat framework for the classification of data, for comparative studies, and, more particularly, for the formulation of criteria used in determining how state school support funds were to be distributed. While there has been little agreement, indeed some confusion, in the selection of specific measures indicative of these concepts,³⁵ they continue to form a useful ordering function. Although these concepts were used essentially for normative purposes, they contained within them positive elements--in their various particular measures. It may be said, then, that these concepts serve to order the complex of factors impinging upon education expenditures.

Measures of Need have ranged from simple counts of the number of children to be educated,³⁶ through ratio measures such as the numbers of school-age children relative to the number of adults,³⁷

³⁴Stephen J. Knezevich, *Administration in Public Education* (New York: Harper and Brothers, 1962), p. 552.

³⁵Edgar L. Morphet, "Characteristics of State Support Programs," in R. L. Johns and E. L. Morphet, eds., *Problems and Issues in Public School Finance* (New York: Teachers' College, Columbia University, 1952), p. 168.

³⁶John K. Norton and Margaret A. Norton, *Wealth, Children and Education* (New York: Teachers' College, Columbia University, 1938), p. 28.

³⁷Kenneth F. Argue, *Financing Education in the Canadian Provinces* (Ottawa: Canadian Teachers' Federation, 1941); and John E. Cheal, *Investment in Canadian Youth* (Toronto: Macmillan Company of Canada, 1963).

to detailed indexes based on average daily attendance which take into account cost variations due to population sparsity, relative numbers of secondary as opposed to elementary pupils, and living-cost differences.³⁸ Empirical studies of determinants of education expenditures have usually employed a measure of the number of children to be educated as indicative of Need.³⁹ In large measure these various approaches employ differential population counts and may, therefore, be broadly classified as Demographic determinants.

The concept of Ability embraces measures of economic resources, especially of the "economic power behind each pupil."⁴⁰ More particularly, the concept concerns the determination of theoretical ability to pay taxes in support of schools. Approaches to the measurement of economic resources have varied from measures of property valuations,⁴¹ and of personal income,⁴² to measures of wealth and production.⁴³ Approaches to the problem of theoretical ability to pay seek to

³⁸Paul R. Mort, *State Support for Public Education* (Washington: American Council on Education, 1933), pp. 47ff.

³⁹Brazer, *op. cit.*; Hirsch, "Determinants of Public Education Expenditures," *op. cit.*; Miner, *op. cit.*; and Shapiro, *op. cit.*

⁴⁰John K. Norton and E. Edmund Reutter, Jr., "Federal Participation in the Financing of Education," in R. L. Johns and E. L. Morphet, eds., *Problems and Issues in Public School Finance* (New York: Teachers' College, Columbia University, 1952), p. 221.

⁴¹Hirsch, *op. cit.*; and Swanson, *op. cit.*

⁴²Cheal, *op. cit.*; Miner, *op. cit.*; Shapiro, *op. cit.*; and Philip J. Warren, *Financing Education in Newfoundland* (unpublished doctoral dissertation, University of Alberta, 1962).

⁴³Argue, *op. cit.*; and Norton and Norton, *op. cit.*

evaluate tax bases to provide an index of fiscal capacity. Originally indexes were developed on the basis of model or ideal tax systems but this prescriptive approach was found wanting in terms of objectivity and accommodation to variations in local conditions, objectives and preferences.⁴⁴ More recently, there have been attempts to construct indexes based on a representative tax system which "is an average of the tax structures which actually exist in the states, and implies no subjective staff judgment about their quality or desirability."⁴⁵ Common to all these approaches is the endeavour to tap characteristics of community wealth and organization for the production and distribution of wealth. The broad title, Economic Determinants, may therefore be applied to these various measures of Ability.

The concept of Effort alludes to the relationship between actual expenditures and measures of Ability. It encompasses education expenditures as the numerator expressed with either an economic resources measure⁴⁶ or a form of tax measure⁴⁷ as the denominator. While one of the restraints imposed upon Effort is the limitation of resources, particularly of tax resources, within a community, there are

⁴⁴ Advisory Commission on Intergovernmental Relations, *Measures of State and Local Fiscal Capacity and Tax Effort* (Washington: Government Printing Office, 1962), p. 31.

⁴⁵ *Ibid.*, pp. 31 - 32.

⁴⁶ Argue, *op. cit.*; Cheal, *op. cit.*; Warren, *op. cit.*; and M. E. LaZerte, *School Finance in Canada* (Ottawa: Canadian School Trustees' Association, 1955).

⁴⁷ Advisory Commission on Intergovernmental Relations, *op. cit.*; Norton and Norton, *op. cit.*; and Swanson, *op. cit.*

other restraints which the above measures do not tap directly but imply. There is, for instance, the restraint of the public's expectations with regard to what it considers as fair and reasonable taxation burden. These expectations are conditioned, in part, by the inherited practices of previous years, and by the public's attitudes towards education. These restraints go behind the concept of Effort to the factors that help determine the extent of Effort.

The restraint of limitation of resources refers to Ability or Economic factors. The restraint of tolerance of tax levels refers, in part, to the traditional form of tax structure, which is an Economic factor. The restraint of tolerance of tax levels refers, also, to attitudes towards education, which are Social factors.

While recognizing the kindred controls of Economic and Social factors, Effort is, in the final analysis, a Political function. Placing Effort in the broad class of Political determinants gives it much more of its catholic meaning than the original ratio measures of Effort were ever meant to convey. This wider meaning, however, is in no way inimical to the earlier uses of the term.

To this point, the identification of Need, Ability, and Effort determinants conforms to the concepts implicit in Panel 9 of Mort's Sequential Simplex model. These concepts have been specifically recognized in these terms by Swanson.⁴⁸ As a result of the preceding discussion, these concepts have been subsumed within the broader

⁴⁸Austin D. Swanson, "A Missing Concept in Theories of School Finance," *Educational Administration Quarterly*, Vol. 1 (Spring, 1965), p. 44.

classifications of Demographic, Economic-Social, and Political determinants. The partial class of Social determinants refers to descriptive characteristics of the population reflective of attitudes towards education. The purposes of these broader classifications are to contain the original concepts, to expand their bases to encompass the complex array of factors influencing education expenditures, and to remove the normative connotations associated with the original concepts. Diagrammatically, this analysis of the determinants of education expenditures is shown in Figure 2.

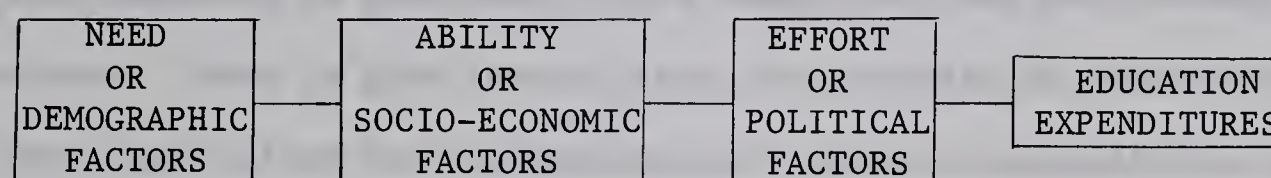


Figure 2. Determinants of education expenditures.

The arrangement of the diagram is not intended to be sequential. To this point, there are no implications beyond the proposition that education expenditures are influenced by a complex of determinants, each of which may be classified as either Demographic, Socio-Economic, or Political factors.

In consideration of this arrangement, it is useful to distinguish two wider classes of determinants within which the Demographic, Socio-Economic and Political classes may be subsumed. First, there is the class of factors which forms the "givens" of a particular situation, being either immanent or in some degree fortuitous. Demographic and

Socio-Economic factors are descriptive of the constitution of a community providing the factors impinging upon education expenditures which lie outside the sphere of choice. Alternatively, there is the class of factors which is the outcome of political decisions relating to education expenditures and which is, therefore, relatively free to be produced. Political factors belong in this category.

The former class of Demographic and Socio-Economic factors describe the characteristics of a community which provide the raw material for which, about which, and upon which political decisions are imposed. All political actions are derivable, in some degree, from the character of the community as described in its Demographic and Socio-Economic features. There is good reason, then, for thinking of these features as more remote from the determination of education expenditures than the Political actions which, evolved from these features, impinge upon education expenditures more directly. The former class of factors constitutes primary determinants and, as it involves factors over which educational policy-makers have little control, may be called Non-Policy determinants. The latter class of factors constitutes secondary determinants and, as it involves factors over which educational policy-makers have, relatively, control, may be called Policy determinants.

It is apparent that causation is to some degree associated with this sequence of events. The direction of flow is from Non-Policy determinants to Policy determinants to education expenditures. It is proposed that this twofold classification is pertinent in that it resolves a fundamental problem evident in some of the previous empirical

studies of the determinants of education expenditures (*supra*, p. 21).

The following quotation from Miner expresses the dilemma:

The omission of this factor [state and federal aid to education] probably reduces the variance explained by the final equation. But the variables included in this analysis go behind state and federal grants to the factors that determine them. *To the extent that these intergovernmental grants are themselves direct determinants of expenditures*, this approach is deficient. However, the effects of grants-in-aid for education are *primarily the consequence of the economic and demographic characteristics in local communities* that determine the size of the intergovernmental payments. From this standpoint the method used in this analysis is superior because it estimates the effects of these community factors directly rather than through *the intervening variable* of state and federal aid.⁴⁹

In resolution, therefore, it is suggested that Non-Policy determinants (made up of Demographic and Socio-Economic factors) form the basic class of factors influencing education expenditures. It is further suggested that Policy determinants (made up of Political factors) form an intervening class of factors influencing education expenditures, and that this class is itself determined by the Demographic and Socio-Economic factors representative of the Non-Policy determinants. Figure 3 provides a diagram of this analysis of the determinants of education expenditures.

⁴⁹Miner, *op. cit.*, p. 76. Emphases added.

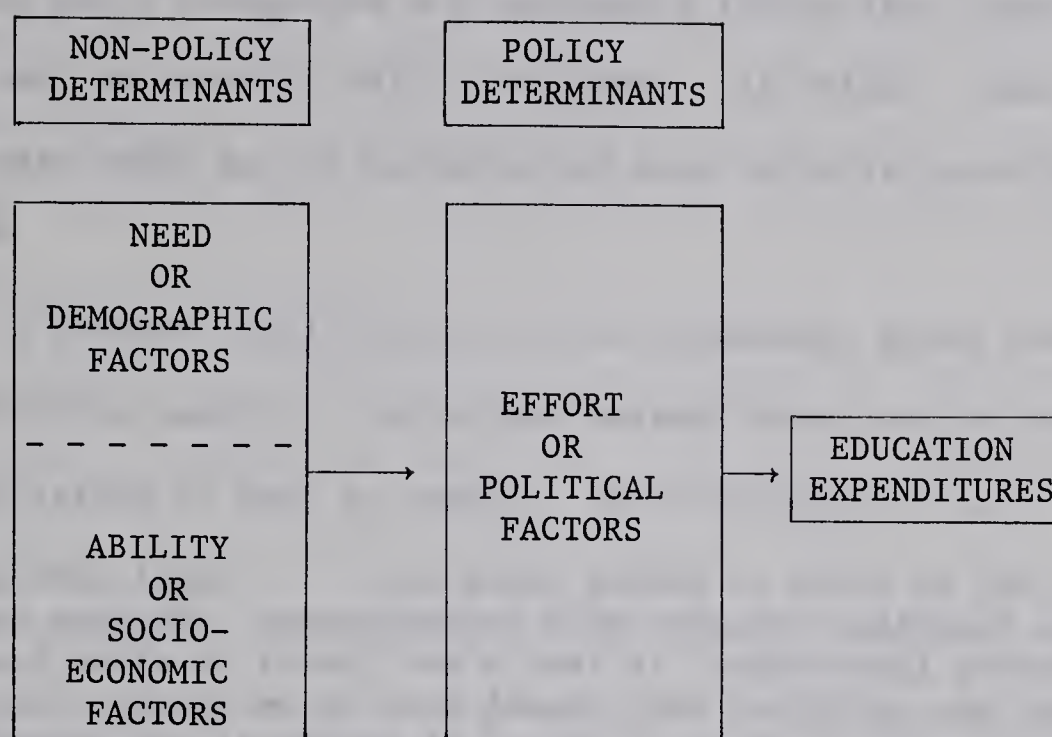


Figure 3. A model of the determinants of education expenditures.

Analysis of the Suggested Model

Policy and Non-Policy determinants. The distinction between these categories may be explained by analogy with certain basic concepts from price theory in economics. Price theory focuses, in part, on the production costs of a firm. For this purpose it has developed several analytic concepts as theoretical tools to assist in the identification of crucial elements which will provide explanatory determinants of production costs. Two major categories of production costs are specified--fixed costs and variable costs. Fixed costs are those which in the aggregate are absolutely invariant to changes in output, and are the costs of fixed factors such as depreciation and interest charges. Variable costs are those which in the aggregate vary with output, and are the costs of variable factors such as wages and materials.

These two major categories are expressive rather than unequivocal, and are not necessarily fully consistent. In effect, there are some fixed costs which may be variable and some variable costs which may be fixed.⁵⁰

To promote clarification of the dichotomy, price theorists make a further analytic distinction between short period and long period relation of cost to output. Bain describes it as:

In formal logic . . . the short period to which we shall refer is no especial chronological time interval uniformly applicable to all sorts of firms, but a sort of 'operational period' arbitrarily defined as of such length that buildings and long-lived equipment are invariant in quantity and that labour and materials are freely variable in quantity.⁵¹

Hence, the longer the time period envisaged the fewer are the factors which may be considered as fixed. Thus the dichotomy between fixed and variable cost factors is essentially a short period concept.

The two major categories of determinants of education expenditures, Non-Policy and Policy factors, may be likened to the concepts of fixed and variable costs in the one sense that clarification of the dichotomy revolves upon the short period concept. For instance, the existence of a separate school system might be expected to act as a determinant of the level of school expenditures,⁵² and the existence of a separate school system is derivative from a political

⁵⁰Joe S. Bain, *Price Theory* (New York: Holt, Rinehart and Winston, 1961), p. 91.

⁵¹*Ibid.*, p. 90.

⁵²Cheal, *op. cit.*, pp. 114 - 115.

decision. Once established, however, this factor cannot realistically be considered as capable of manipulation in the sense that the function of choice prevails. This constitutional "given" has assumed the substance of immanence, set in tradition, and has become an intrinsic part of the environment.

Logically this factor may now be considered a pivotal aspect of the community's attitude to education. It enters, therefore, into the Social factor class rather than the Political factor class. It is fruitful to think of the Non-Policy and Policy categories within a form of "operational time period", kindred to the short period concept, which may be arbitrarily defined as of such length that constitutional constraints (such as leaving age and separate school system) are impervious to political manipulation, while factors such as pupil-teacher ratios and state aid are accessible to variation by policy-makers.

This distinction in terms of an arbitrarily defined time period is crucial to the dichotomy between the two major categories. It may easily be shown that Demographic and Socio-Economic factors are capable of manipulation by political action. Pierce, for instance, has reasoned that community change may be guided and controlled by educators working in concert with planning boards and zoning authorities.⁵³ There is abundant literature on methods available to educators for developing supportive attitudes to education and activating the public to an awareness of the need for better schools.

⁵³Truman Mitchell Pierce, *Controllable Community Characteristics Related to the Quality of Education* (New York: Teachers' College, Columbia University, 1947), Chapters 3 and 4.

It is a thesis of this study that actions such as these are longer range activities, both in their stimulus and their effects, than the more immediate political actions impinging directly upon education expenditures, such as the determination of salary levels and the amount of state aid. The distinction between Non-Policy and Policy determinants is not, therefore, rigid but it is analytically pertinent in that it allows for the grouping of factors according to their apparent susceptibility to political manipulation.

Two further points need emphasis. First, a distinction has been made between Demographic and Socio-Economic Non-Policy factors, largely in order to contain the original Need and Ability concepts. This distinction, however, will not be pursued in this study. Demographic factors will, hereafter, be contained within the broad category of Socio-Economic factors, since aspects of population counts are, basically, reflective of the Socio-Economic characteristics of a community.

Secondly, the developed model focuses attention on the singular universe of the province. Within this universe each of the perceived determining factors is considered as a totality. The province forms the community and within this community there is an ensemble of factors influencing education expenditure levels. No attempt has been made to separate each of the factors in terms of the school systems that constitute the provincial community. Hence, Political factors in particular are not isolated in terms of the different levels of government responsibility. For the purposes of this study, a factor perceived as amenable to political manipulation in the short run is a

Policy determinant irrespective of the government unit responsible for its resolution. The model is a macro-scope approach to the study of the determinants of education expenditures.

Placement of factors. From the literature of studies into the determinants of education expenditures a list of identified and presumed explanatory factors was derived. Each of these factors, or variables, may be fitted into the developed model of the determinants of education expenditures, as shown in Figure 4. The diversity and complexity of these possible influencing variables is apparent, and the listed variables cannot be expected to exhaust all possibilities.

As mentioned previously, it is not easy to assess the relative importance of separate factors as determinants of education expenditures from a survey of the completed empirical studies. This occurs because the studies work with different dependent variables, use diverse measures of selected factors, and apply to a variety of organizational units. A brief explanation of the placement of factors in the model developed in this study is in order.

Among the Non-Policy determinants there would be no quarrel with the placement of the selected Need and Ability factors. Population characteristics, debt service, and factors relating to community wealth are clearly intrinsic to the situation and beyond the ability of policy-makers to vary--certainly in the short period. The only major class of possible influencing factors neglected in this, is the class of physical determinants embracing such factors as climate and physiography. There are good reasons for abandoning this class in

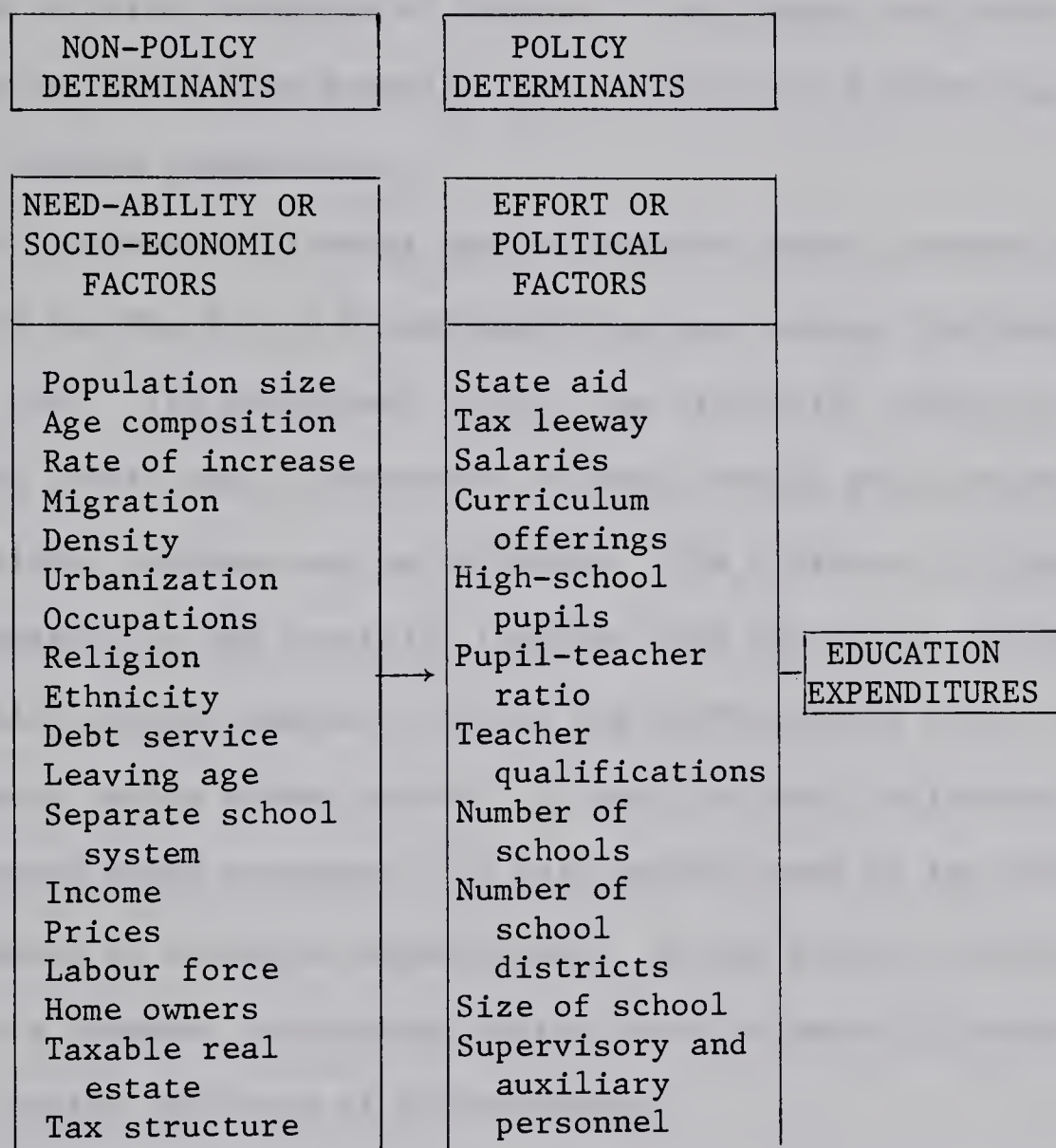


Figure 4. Expanded model of the determinants of public education expenditures.

a model of the determinants of education expenditures in Canada. Among the provinces there are not the excessive climatic variations of the scope and moment that international comparisons would entail. Further, the dubious direct influences of physiological factors are usually restricted to direct measures of density of settlement and school district size, which more properly appear within the Economic and Political classes respectively.

The placement of leaving age and separate school system factors within the Non-Policy determinants has been argued previously (*supra*, p. 39). The additional factor, tax structure, refers to the legally and traditionally determined schemes through which revenue for educational purposes may be collected. The division of financial responsibility and controls, together with the use or non-use of particular revenue sources, between the provinces and local units of government varies across Canada. It could be that variations in tax structures among provinces will help explain some of the variation in levels of education expenditures. In any event, this may be considered a presumed determining factor which is patently outside the short period influence of policy-makers.

The placement of factors within the second major category, Policy determinants, follows from the earlier discussion of the distinction between Policy and Non-Policy determinants (*supra*., pp. 37 - 39). There are two notable features concerning the ensemble of listed factors. First, it is apparent that each factor is an intervening variable between the Non-Policy determinants and education expenditures. While it is suggested, in consequence, that each of the

Policy variables is a progeny of the antecedent Non-Policy factors, it is not possible to specify the particular relationships between any two of the different variables. This occurs because of the extremely complex pattern of inter-relationships. Wealth factors alone, for instance, have strong, if not preponderant, influences on many of the Policy variables. Logically, certain of the intervening variables appear clearly related to particular Non-Policy factors: salaries to income, state aid to tax structure, size of schools to urbanization, and number of districts to density are examples. Aside from these, any attempt to trace singular relationships is a tenuous operation.

The second notable feature concerning the Policy variables is the possible contention that they may be consequences rather than determinants of education expenditures. The contention is neither improbable nor infallible. Miner suggests that variables such as salaries and number of supervisory and auxiliary personnel "may" be considered consequences of expenditures.⁵⁴ The Sequential Simplex model indicates that these variables, together with teacher qualifications, derive from expenditure levels rather than the reverse.⁵⁵ Miner, however, argues in favour of a salary variable as a measure of costs, and includes measures of state aid, supervisory and auxiliary personnel, and high school pupils as determinants of expenditures in his empirical analysis. Similarly, the Sequential Simplex model considers size of school district and numbers of high school pupils as

⁵⁴Miner, *op. cit.*, p. 62.

⁵⁵Mort, "School and Community Relationships to School Quality," *op. cit.*, pp. 107 - 109.

determinants of expenditures, and places pupil-teacher ratios within the same panel as expenditure levels. The present study accepts and follows these latter positions.

There is one further general class of factors influencing the level of education expenditures which needs to be considered. This is the class of factors associated with "educational climate". This phrase encompasses the role of preferences, reflective of attitudes, which help determine the level of educational services provided. It would be expected that strong preferences for education, indicative of a high or sound "educational climate", would raise school expenditures. It may be argued that people can hold strong positive feelings about education and yet balk at increased expenditures. This reasoning would seem to create a double entendre in that it negates the apparent strength of the presumed attitudes.

Again, it can be argued that the public is disinclined to reveal its preferences for services which are publicly provided, partly for fear of increased taxation. For economists, however, money is generally held to be the measuring rod of preferences. If people really have strong positive preferences, then it is assumed that they are willing to pay something, either directly or in the form of reduced income, towards the achievement of their preferred goals.⁵⁶ Given other things being equal, such as the standardization of costs of educational services, it would seem perfectly valid to expect that higher education expenditures are indicative of stronger preferences for education

⁵⁶Gary S. Becker, *The Economics of Discrimination* (Chicago: University of Chicago Press, 1957), p. 6.

services. While this approach mirrors preferences, it does not indicate the sources of the presumed preferences. Logically, there are many non-pecuniary factors like race, religion, social class, and administrative action forms which help initiate certain attitudes.

Mort has recognized these two approaches to the analysis of preferences in his Sequential Simplex model. In Panel 7 of this model, education expenditures are held to be partly reflective of the "educational climate", while the preceding Panel 9 universe of characteristics of community population and wealth impinges directly upon the formation of the "educational climate". In addition, Mort suggests there are elements of legal structure that favour administrative action to promote a higher "educational climate". He hypothesizes tentative elements as, "the character of the tax and budget power of the school district, the amount of state aid, and the working arrangements with profession and public leading to community decisions on support level and general character of the school program."⁵⁷ Further, both Mort and Swanson suggest measures of the number of groups who have expressed some interest in the schools as symbiotic of the "educational climate".⁵⁸

The model developed in this study takes each of these several factors into account, except for measures of interested groups and decision-making arrangements. The exception of the latter measures has

⁵⁷ Mort, "School and Community Relationships to School Quality," *op. cit.*, p. 211.

⁵⁸ *Ibid.*, p. 211; and Austin D. Swanson, *Effective Administration Strategy* (New York: Teachers' College, Columbia University, 1961), p. 61.

been occasioned by the difficulties of quantification in a macroscopic provincial investigation. In this study, therefore, the general class of factors associated with "educational climate" has been contained within Non-Policy determinants related to characteristics of population, wealth, and tax structure which, together, are illustrative of the sources of differential preferences. Further, they have been contained within the Policy determinants as indicative of the scope of services provided and, therefore, reflective of presumed preferences.

SUMMARY

It has been shown that the formulation of a theoretical model of public expenditures for education determinants is an important preliminary to the investigation proposed in this study. The formulation of the model serves to define the problem area, conceptualize the relationships among the phenomena which are to be evaluated, and define a structure within which previous studies may be viewed.

The genesis of the model was found to rest on the assumption that public education expenditures are systematically subject to identifiable determinants. This assumption derived from the work of Adolph Wagner, and has been tested in a number of empirical investigations of the determinants of education expenditures in the United States. It was from these investigations that a list of presumed and identified factors influencing levels of education expenditures was derived.

The theoretical model of determinants of public elementary and secondary education expenditures among the provinces of Canada was

developed on the basis of the concepts Non-Policy and Policy determinants. These concepts provide a focus of attention that has been lacking in other treatments of the problem.⁵⁹ Furthermore, it is proposed that the model provides an articulation between the socio-economic determinants of education expenditures and the intervening determinants which are derivative from the former. Finally, the model permits relating the traditional concepts of Need, Ability, and Effort to more recent studies of the determinants of education expenditures.

The fundamental distinction between Policy and Non-Policy determinants rests on the essential point that the former are very much more susceptible to influence by policy-makers than the latter. It is recognized that the policy-makers' latitude of influence on Policy factors is restricted by a variety of forces, such as pressure groups and traditional community expectations. Nevertheless, each of the Policy factors is capable of some manipulation in contrast to the relatively static and immanent natures of the Non-Policy factors.

The basic purpose of the model is to provide a basis upon which the empirical phases of this study may be cast. Since the model was developed without due regard to the feasibility of data collection, the following chapter will describe the variables selected, and the approach and statistical techniques to be used in the empirical investigation of determinants of public education expenditures among the provinces of Canada.

⁵⁹ Miner, *op. cit.*, pp. 146ff has suggested: "In the discussion of future trends it is useful to distinguish those independent variables whose values can be influenced by public policy and those determined by forces outside the realm of choice." The present author came to these concepts independently.

CHAPTER III

THE VARIABLES AND TECHNIQUES

The purpose of this chapter is to set out the variables and techniques used in the analysis of current expenditure per pupil in public elementary and secondary schools, X_1 . The analysis is based upon the theoretical model of determinants of public education expenditures which was formulated in the previous chapter. The selected variables are described in this chapter, and their sources of data indicated. In addition, mention is made of the variables whose use was anticipated, but which did not enter into the analysis since their data could not be collected.

The approach used is a series of three cross-section analyses. The statistical techniques make extensive use of multiple regression.

THE DEPENDENT VARIABLE

The selection of an explicit measure of educational spending for use as a dependent variable in this study is not fore-ordained. Previous empirical studies have worked with a variety of spending measures. Of the various issues involved, there is general accord on the necessity to restrict the spending measure to current as opposed to capital outlays.

By definition, capital outlays create durable assets, hence are much less regular than outlays for other functions. This irregularity

is due to the uncertain demand for additional durable assets as it accrues from population changes and the unpredictable effects of social dislocations and innovations. It is also due to the availability of savings upon which all capital spending ultimately depends. In contrast, current spending concerns present consumption paid largely from existing revenues. The essential difference is that decisions to spend on capital are "based on quite different considerations from those determining levels of public expenditures for current operations."¹ Capital outlays for public education expenditures are, therefore, omitted from this study.

The corollary to the preceding argument would appear to be the further exception of debt service outlays which accrue from capital spending. Debt service outlays include interest charges and debt repayments. While it is apparent that debt service expenditures depend upon capital spending decisions made in the past, the behaviour of debt service outlays over time is very much more regular than that of capital spending. Debt service outlays represent a commitment in money terms which can be predicted and which reduce the amount of current funds available for operating expenditures. It could be expected, then, that debt service outlays would affect relationships between operating expenditures and explanatory factors.²

In this study, the approach will be to treat debt service outlays as an independent variable, and to further restrict the dependent variable by omitting debt service expenditures. This study, then, is

¹Jerry Miner, *Social and Economic Factors in Spending for Public Education* (Syracuse: Syracuse University Press, 1963), p. 70.

²*Ibid.*

concerned only with current expenditures for elementary and secondary public education. Current expenditures are defined as total expenditures less capital, interest, and debt retirement outlays. Such current expenditures make up about 80 per cent of all expenditures on public elementary and secondary education in Canada.³

Current expenditures may be treated totally or proportionally. The use of current expenditures outright as a dependent variable gives population size much too heavy an influence, and is rarely preferred. Of the two traditional ratio measures, per pupil and per capita, the former suggests the rate of investment in each pupil, or the amount of educational services provided, and is of special interest to educators.⁴ Per pupil ratios remove much of the effects of different pupil-population sizes. Relative numbers of secondary as opposed to elementary pupils are not, however, taken into account. These differences will be considered in the selection of independent variables.

The customary procedure of considering only those pupils in full-time schools, and, of these, those in average daily attendance⁵ will be followed in this study.

³Calculated from: D.B.S., *Survey of Education Finance, 1962* (Ottawa: Queen's Printer, 1965), Tables 11 and 28.

⁴Miner, *op. cit.*, p. 72; John E. Cheal, *Investment in Canadian Youth*, (Toronto: MacMillan Company of Canada, 1963), p. 49; and Sherman Shapiro, *An Analysis of the Determinants of Current Public and Societal Expenditures Per Pupil in Elementary and Secondary Schools* (unpublished doctoral dissertation, University of Chicago, 1962), p. 29.

⁵Average daily attendance (hereafter A.D.A.): "This is most often based on the class as a unit and is calculated by dividing the aggregate pupil-days attendance of the class for the school year, by the number of days the class was in session. The total for the school, centre or province is then the sum of these figures. However, four provinces calculate average daily attendance differently. The school is the unit in Saskatchewan and Ontario and the province is the unit in Alberta and New Brunswick." DBS., *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1959), p. 31.

A final problem remains, that arising out of changes in the level of prices over time. Education expenditures are measured in current prices, or in money terms, which react sharply to changes in price levels but do not reveal changes in the value of money. One approach to comparing money measures over periods of changing prices is to deflate these measures by an acceptable price index. Price indexes, termed implicit price deflators, are available for translating government expenditures into constant dollars⁶ thereby accounting for variations in the value of money. This method may be misleading since there are changes in the composition of education expenditures over time and there is not a specific education price index to reflect these changes. In the United States, Hirsch has shown how patterns of education expenditures have altered over time.⁷ In Canada, adequate comparative statistics are not available for the composition of provincial education expenditures: "there is no uniformity in what is included in such items as administration, instruction, or plant operation and to show these items . . . might give rise to misleading comparisons."⁸

⁶Implicit price indexes are currently weighted price indexes. The "Government Expenditure of Goods and Services" Index is used, as indexes for "Government Current Expenditure" are not available prior to 1949. The 1949 = 100 series were converted to 1957 = 100. D.B.S., *National Accounts, Income and Expenditure, 1926-56* (Ottawa: Queen's Printer, 1962), p. 36; and D.B.S., *National Accounts, Income and Expenditure, 1964* (Ottawa: Queen's Printer, 1965), p. 56.

⁷Werner Z. Hirsch, "The Costs of Public Education," in Charles S. Benson, ed., *Perspectives on the Economics of Education* (Boston: Houghton Mifflin Company, 1963), pp. 152 - 155.

⁸D.B.S., *Survey of Education Finance, 1961* (Ottawa: Queen's Printer, 1964), p. 30.

For the purposes of this study, it will be assumed that variations in current education expenditures due to changes in the value of money will have been removed by deflating current expenditures into constant dollars. In the process of deflation it would be unwise to restrict the application to one specific year since the irregularity of price fluctuations could result in the inadvertent selection of an unusual year. Hence, government expenditures will be translated into constant dollars by using a three-year average of price deflators, centred on the years involved in this study: 1941, 1951, and 1961.

The dependent variable in this study is based on the per pupil ratio and is: X_1 - current expenditures per pupil in A.D.A. in public elementary and secondary schools in constant 1957 dollars (Education Expenditures). Detailed statements of the sources of data, together with the data upon which this variable is constructed, are provided in Tables XLI, XLII, and XLIII of Appendix B.

THE INDEPENDENT VARIABLES

The selection of independent variables, and their manner of measurement, is designed to conform as closely as possible to the demands of the theoretical model. The selection is limited, essentially, by the availability of data. In Appendix B, there is given the decennial provincial data for each of the independent variables, together with detailed statements of sources, used in this study. While each variable is described in full in this section, and identified by a number, it will assist identification in later chapters if each variable is further marked by an abbreviation. The sub-titles of this section, therefore, list the variables by number and abbreviation.

Non-Policy or Socio-Economic Variables

Variables X_2 (School-age Population) and X_3 (School-age Enrollments). The proportion of children in the population is a measure of the total potential need for educational services. The extent to which this potential need is translated into actual demand for public education is another matter. Miner and Shapiro⁹ have used the crude measure of the proportion of children in the population as indicative of Need with differing results. They also, in common with most other researchers, have used the more realistic measure of the proportion of children in A.D.A. This obviates two notable factors working to reduce apparent potential Need: one, the use which is made of private educational agencies; and two, the school-age children who, for one reason or another, elect not to stay in school.

Commonly the measurement of children in A.D.A. is restricted within specific age limits (usually 5 to 17 years), which is a useful device for encouraging manageability of data but reduces accuracy, particularly at the extreme ages. It would be more rigorous to take a measure of all children in A.D.A., regardless of age, as Miner and Brazer have done.¹⁰ The weakness of a gross measure of A.D.A. is that it fails to distinguish between the children who are compelled to stay in school by law, and those who elect to stay beyond the statutory leaving age. The former group of children represent actual Need, whereas the latter group of children are more indicative of Effort.

⁹Miner, *op. cit.*; and Shapiro, *op. cit.*

¹⁰Miner, *op. cit.*; and Harvey E. Brazer, *City Expenditures in the United States* (New York: National Bureau of Economic Research, 1959).

In terms of the theoretical model, the number of children¹¹ within the legally-defined limits of entry and leaving¹² form the precise measure of Non-Policy determined Need. The number of children remaining at school beyond the set leaving age is more strongly influenced by Policy factors (such as curriculum offerings and counselling services) and is, therefore, to be considered within the Policy determinants category.

Hence, the per cent of total population within the legally-defined school-age limits is designated X_2 . This variable provides a measure of the specific Need for educational services at elementary and secondary levels, but it does not distinguish the precise Need for *public* educational services. To define the public Need, variable X_3 , as per cent of total population within the legally-defined school-age limits who are enrolled¹³ in public elementary and secondary schools, is included. The particular weakness of this latter measure is that there is a notable difference between enrolment data and their

¹¹Population data have as their source the decennial Canada *Census of Population*.

¹²Statutory school-age limits from: D.B.S., *Survey of Elementary and Secondary Education*, 1961-62 (Ottawa: Queen's Printer, 1964), p. 28.

¹³Since 1936, records of "the ages, by single years, of all children enrolled in the schools each year . . . [showing] the ages of pupils as of June 30, or in the case of those who dropped out of school before the end of the school-year, their age at date of leaving." D.B.S., *Survey of Elementary and Secondary Education*, 1950-54 (Ottawa: Queen's Printer, 1959), p. 35.

concomitant A.D.A. figures.¹⁴ The data for A.D.A. are not, however, available in single years-of-age. Detailed statements of the sources of data, together with the data upon which these variables are constructed, are provided in Tables XLIV and XLV of Appendix B.

Variable X_4 (Urbanization). The third independent variable is the per cent of population living in urban places of 10,000 or more,¹⁵ and is designated X_4 . Fabricant found that school expenditures correlated negatively with density (persons per square mile) and urbanization (centres of 2,500 or more), suggesting that this occurred as school employment declined with greater density and urbanization.¹⁶ He

¹⁴The per cent of enrolled pupils in A.D.A. is as follows:

Province	1941	1951	1961
Newfoundland	67.8	85.7	90.2
Prince Edward Island	71.2	80.7	88.7
Nova Scotia	77.0	85.0	92.1
New Brunswick	77.2	81.4	90.8
Quebec	84.3	87.0	93.0
Ontario	91.2	87.5	93.9
Manitoba	84.2	88.1	94.1
Saskatchewan	77.4	82.6	92.6
Alberta	84.7	88.6	95.6
British Columbia	86.2	89.1	92.0

Calculated from: D.B.S., *Survey of Elementary and Secondary Education, 1961-62* (Ottawa: Queen's Printer, 1964), Tables 2-13 and 2-14.

¹⁵An "urban place" is defined as an incorporated village, town, or city with a population of 10,000 or more, and all urban areas of similar size, whether incorporated or not, included in the Census Metropolitan Areas. These Areas, as defined in the Census, relate to groups of urban communities in Canada which are in close economic, geographic, and social relationships. D.B.S., *Census of Canada - Population, 1961* (Ottawa: Queen's Printer, 1963), Introductory Report, p. xi.

¹⁶Solomon Fabricant, *The Trend of Government Activity Since 1900* (New York: National Bureau of Economic Research, 1952), p. 133.

suggested further that salary levels tended to increase with greater density and urbanization, which went towards offsetting the gains made by lower employment ratios.¹⁷ Various measures of density and urbanization have been applied in studies of the determinants of education expenditures since Fabricant's work, with generally insignificant results.¹⁸ The definition of urbanization used in this study is much more limited than the definitions used in earlier studies. It is intended to tap a specific characteristic of urbanization, that of particularly large aggregates of people. The data, and its sources, for this variable are given in Table XLVI of Appendix B.

Variable X₅ (Migration). Another important dimension of population characteristics is mobility. Miner tested the variable, percent of families who have been in the community for less than five years, as indicative of mobility. He found its effect on school expenditures to be negative, but not greatly so.¹⁹ Logically, it would seem that an increased amount of mobility would be associated with higher educational expenditures, particularly in the receiving area. It is felt that the relatively young "upward mobiles" are those who largely seek movement to areas of greater economic potential. The corollary is that the influx of significant numbers of migrants will impose pressures on the existing facilities forcing an expansion

¹⁷ *Ibid.*, p. 134.

¹⁸ Brazer, *op. cit.*; Miner, *op. cit.*; Shapiro, *op. cit.*; and Werner Z. Hirsch, *Analysis of the Rising Costs of Public Education* (Washington: Joint Economic Committee, 1959).

¹⁹ Miner, *op. cit.*, p. 103.

in spending. An index of migration,²⁰ based on a ratio of provincial gains and losses in population, is developed for use in this study, and is designated X_5 . The sources of data and the provincial indexes for this variable are shown in Table XLVII of Appendix B.

Variable X_6 (Population Education Level). It has long been held that the demand for education is cumulative in the sense that the attained educational levels of the adult population have a direct influence on the current demand for education of children. This occurs by parents seeking, at the very least, the equivalent of their own educational levels for their children. Actually, there is a strong presumption that parents encourage their children to go beyond the educational level that they attained themselves. In this sense, the demand for education is cumulative and is akin to the economic concept of a multiplier effect.

In a study of the determinants of demand for college education, Brazer and Martin concluded that, "the education [attained by] the spending unit head proved to be the most important factor influencing the education level of the children."²¹ When variables indicative of educational level of the population have been introduced into studies of the determinants of elementary and secondary education expenditures,

²⁰The Index of Migration is constructed as the actual increase in population as a per cent of natural increase in population by taking ten-year data in 1931-41, 1941-51, and 1951-61, and averaging for the single years 1941, 1951, and 1961. The source of data was: D.B.S., *Canada Year Book, 1963-64* (Ottawa: Queen's Printer, 1964), Tables 1 and 20.

²¹Harvey E. Brazer and David Martin, "Social and Economic Determinants of Demand for Education," in Selma J. Mushkin, ed., *Economics of Higher Education* (Washington: Department of Health, Education, and Welfare, 1962), p. 26.

they have not proven significant.²² The proposition remains logically defensible, particularly in view of the growing evidence that additional lifetime earnings accrue from extended amounts of formal education, even at the secondary school level.²³ In this study, the fifth independent variable is included to ascertain this effect in Canada. The variable, per cent of population²⁴ with nine or more years of formal education, is designated X_6 . The source of this data is the decennial *Census of Canada*. Both the sources of data and the provincial data are given in Table XLVIII of Appendix B.

Variable X_7 (Roman Catholic Population). The sixth independent variable is per cent of population Roman Catholic, and is designated X_7 . In both the United States and Canada there are significant concentrations of distinctive population groups: the Negroes in the United States and the Roman Catholics, particularly French in Quebec, in Canada. In each case it is presumed that higher proportions of these groups will be related to lower education expenditures on the further assumption that this is indicative of lower relative preferences for education. Renshaw, Miner, and Shapiro have tested this presumed influence for Negroes with generally significant results.²⁵ In Canada, Cheal has directed attention to the influence of religious

²²Miner, *op. cit.*; and Donald H. Ross, ed., *Administration for Adaptability* (New York: Metropolitan School Study Council, 1958).

²³Gary Becker, *Human Capital* (New York: National Bureau of Economic Research, 1964), Chap. VI; and Brazer and Martin, *op. cit.*, p. 29.

²⁴Population refers to the non-school population.

²⁵Edward F. Renshaw, "A Note on the Expenditure Effect of State Aid to Education," *The Journal of Political Economy*, Vol. 68 (1960), pp. 170 - 174; Miner, *op. cit.*; and Shapiro, *op. cit.*

affiliation on education expenditures, concluding that "denominationalism is a factor in Canadian education that is associated negatively with those variables that contribute to high educational output."²⁶

Brazer and Martin, in the study cited previously, found that "a significant relationship appears between the affiliation of the parent and the education attainment of the children."²⁷ In this study, variable X_7 (Roman Catholic Population) is included to determine the relationship between education expenditures and religious affiliation, specifically, Roman Catholic affiliation. The sources of data are the decennial *Census of Canada*, and the data are provided in Table XLIX of Appendix B.

Variables X_8 (Income Distribution), X_9 (Personal Income), X_{10} (Number of Dependents). Measures of income have been used extensively in studies of the determinants of school expenditures. The measures are held to be representative of the economic ability, or fiscal capacity, of communities to support public education. Measures of income have consistently proven highly significant in studies of determinants of education expenditures. This has encouraged considerable dependence upon these measures for the determination of state support programmes, and as apparently definitive explanations of much of the variations in education expenditures among districts and states. The income measures, however, are not entirely satisfactory. The University of Wisconsin Cooperative Research Project of 1963 suggests that, "No single measure

²⁶Cheal, *op. cit.*, p. 133.

²⁷Brazer and Martin, *op. cit.*, pp. 36 - 37.

of wealth presently used adequately describes the ability of a community to support public services."²⁸

One product of this uncertainty has been declaration of specific single measures of income as the best available. The Wisconsin Project claimed net personal income tax paid as the most adequate measure of fiscal capacity,²⁹ Kelly opted for median family income,³⁰ the economist Studenski put his confidence in per capita income,³¹ while others assert disposable personal income,³² amount of equalized property valuations,³³ and the proportion of home-owners.³⁴ It is apparent that measures of income require careful appraisal.

The most commonly used measure of economic ability is personal income per capita. Since this measure has been selected for use in

²⁸University of Wisconsin Cooperative Research Project No. 1495, "Economic Impact of State Support Models on Educational Finance," *Mimeo* (Madison: University of Wisconsin, 1963), p. 3.

²⁹*Ibid.*

³⁰James H. Kelly, "A Study of the Determinants of Public School Expenditures," *Mimeo* (New York: National Conference of Professors of Educational Administration, 1964), p. 2.

³¹Paul R. Studenski, *Measurement of Variations in State Economic and Fiscal Capacity* (Washington: Bureau of Research and Statistics, 1943), p. 32.

³²Cheal, *op. cit.*; and Austin D. Swanson, *Effective Administration Strategy* (New York: Teachers' College, Columbia University, 1961).

³³Miner, *op. cit.*; and Thomas H. James, *School Revenue Systems in Five States* (Stanford: University Press, 1961).

³⁴Paul R. Mort, "School and Community Relationships to School Quality," *Teachers' College Record*, Vol. 55 (January, 1954).

this study, it is pertinent to consider its appraisal. In an analysis of this measure, Studenski concluded that it furnished a good index of both fiscal and economic capacities provided it was adjusted for certain inherent weaknesses.³⁵ Five major shortcomings were specified.

First, per capita personal income is an average figure and presumes that there are no significant differences in the distribution of income among provinces. Capacity to pay taxation is affected by the distribution of income and it cannot be assumed that provinces with similar per capita incomes have, thereby, similar fiscal capacities. Greater inequality of distribution considerably reduces fiscal capacity for regressive taxes, which form the basis of educational revenues.³⁶

Secondly, per capita incomes are based solely on incomes received. Whereas income received and income produced are equated nationally, there is no certainty that they will be equated at provincial levels. A recent study concluded, "when one shifts from measures of income received to measures of income produced, more marked differences appear in the relative position of states."³⁷ The particular difficulty with this criticism is that data are not available for income produced at provincial levels.

Thirdly, any single year measure of personal income assumes that income levels are reasonably stable over the short period. In

³⁵ Studenski, *op. cit.*, p. 32.

³⁶ *Ibid.*, pp. 59 - 60.

³⁷ Advisory Commission on Intergovernmental Relations, *Measures of State and Local Fiscal Capacity and Tax Effort* (Washington: Government Printing Office, 1962), p. 53.

fact, excessive variations may occur from year to year, particularly in agricultural provinces. To protect against this weakness, Studenski suggests that the average of per capita personal incomes over three years be used in place of an unwarranted reliance upon a single year's measure.³⁸

Fourthly, per capita measures eliminate variations due to gross population sizes on the assumption that the age compositions do not vary in any significant manner. Perhaps of all the weaknesses in per capita measures, this is the most significant, for age compositions do vary importantly among the provinces. It would be unwise to neglect consideration of different dependency burdens in any study of the determinants of education expenditures. It could be expected that a positive relationship would exist between the proportion of the population in the work force and the degree to which the population can afford to allocate resources to education. The higher the ratio of workers to dependents, the greater, it would be anticipated, would be the ability of the economy to devote resources to education with concomitantly less loss of satisfactions in other areas.

In 1941, Newton Edwards discovered wide differences among American states for the combined burdens of old and young dependents. Young dependents he defined as those between 5 and 17 years-of-age, and old dependents were those persons 65 years-of-age and over.³⁹ While noting that imbalances were tending to become less marked, Edwards

³⁸ Studenski, *op. cit.*, pp. 54 - 55.

³⁹ Newton Edwards, *Equal Educational Opportunity for Youth* (Washington: American Council on Education, 1941), p. 50.

made clear that the incidence of dependency in relation to the economically productive age group worked an inverse relationship with the amount of expenditures on public education. In 1954, Peacock and Paish wrote lucidly on the value of considering dependency as a dimension of ability to pay for education.⁴⁰ In a 1959 study of state income differences, Hanna found that, by substituting total labour force for total population as the denominator in per capita income computations, the relative inter-state personal income differences were reduced by 14 to 23 per cent.⁴¹ In 1963, Cheal defined Need as "the ratio of school-age population to the potential adult labour force."⁴² It would be unwise, therefore, to neglect consideration of differential dependency burdens.

The fifth major shortcoming of per capita income measures, when applied to provincial comparisons, is the implicit assumption that there are no significant differences in the relative values of the dollar. Unfortunately, price indexes are only computed on a national basis in Canada, with the exception of the "spatial" food index based on Winnipeg, which has limited value since food prices tend to be standardized throughout the nation.⁴³ The paucity of data on cost-of-living differences may not be a serious issue.

⁴⁰Alan T. Peacock and F. W. Paish, "Economics of Dependence," *Economica*, Vol. 21 (1954), pp. 270 - 299.

⁴¹Frank A. Hanna, *State Income Differentials, 1919 - 1954* (Durham: Duke University Press, 1959), p. 204.

⁴²Cheal, *op. cit.*, p. 70.

⁴³Eric J. Hanson, *Fiscal Needs of the Canadian Provinces* (Toronto: Canadian Tax Foundation, 1961), p. 13.

Several studies of the relative cost-of-living in the United States have indicated that regional cost variations tend to be so narrow as to be negligible in effect.⁴⁴ Whereas it might be assumed that the general cost-of-living is relatively constant throughout the nation, the costs of labour do vary distinctly.⁴⁵ The issue of labour costs is of importance.

Solomon Fabricant, in his study of government in the United States, found:

In schools . . . the price factor is of outstanding importance. School salary levels are highly correlated with incomes . . . it appears that school expenditures are high in high income states mainly, but not entirely, because salaries are high.⁴⁶

Swanson has suggested that, since living costs are relatively constant, "The general salary level of the labour market appears to be the principal condition causing regional differences in educational costs."⁴⁷ His conclusions from a study of national variation in the costs of education are worth noting in some detail:

It is a well-established fact that there is a difference in expenditure among regions in the United States. There has always been the suspicion, however, that marked differences in expenditure among sections implied sectional differences in school quality. This suspicion cannot be substantiated . . . It has definitely been established that there are regional differences in the cost of education . . . In general, if disposable personal

⁴⁴Advisory Commission on Intergovernmental Relations, *op. cit.*, p. 105; Studenski, *op. cit.*, p. 43; and Swanson, *op. cit.*, p. 8.

⁴⁵H. D. Woods and Sylvia Ostry, *Labor Policy and Labor Economics in Canada* (Toronto: MacMillan Company of Canada, 1962), pp. 469 - 471.

⁴⁶Fabricant, *op. cit.*, p. 133.

⁴⁷Austin D. Swanson, "A Missing Concept in Theories of School Finance," *Educational Administration Quarterly*, Vol. 1 (Spring, 1965), p. 48.

income is high, its effect is to depress the purchasing power of the educational dollar; if disposable personal income is low, the effect is the reverse.⁴⁸

It would seem, then, that cost-of-living differences may be ignored in per capita income measures, but adjustments should be made to salary levels of teachers to account for variations in the costs of labour.

This discussion of the weaknesses in per capita income measures is considered important in view of the fact that these measures consistently prove highly significant as explanatory variables in studies of the determinants of education expenditures. Having determined the requirements for increased precision, it is necessary to detail the specific measures to be used in this study.

The seventh independent variable is the wage-earners income distribution index, and is designated X_8 (Income Distribution). Any attempt to measure the extent of inequality of income distribution with a nationally set income figure, such as per cent of families with incomes in excess of \$10,000 as used by Miner,⁴⁹ will be heavily weighted in favour of the high income provinces. It would be more appropriate to compute the coefficient of variation⁵⁰ for provincial income distributions. The Census reports provide only partial frequency distributions of the incomes of wage-earners. The failure of the Census

⁴⁸Austin D. Swanson, *Effective Administration Strategy* (New York: Teachers' College, Columbia University, 1961), pp. 5 - 16.

⁴⁹Miner, *op. cit.*

⁵⁰The coefficient of variation shows what per cent the standard deviation is of the mean. It is particularly useful in making comparisons of variability when means are unequal. Henry E. Garrett, *Statistics in Psychology and Education* (New York: David McKay Company, 1962), pp. 57 - 59.

division to provide a full frequency distribution of incomes is unfortunate, since the raw data are available from the original questionnaire returns. Adequate frequency distributions are available to an upper limit of \$2950 in 1941, \$3000 in 1951, and \$6000 in 1961. It is from these partial distributions that the coefficient of variation for provincial income distributions of wage-earners is computed. The indexes, and their sources of data, are given in Table L of Appendix B.

As data are not available for income produced at provincial levels, it is not possible to include a measure of this variable in the analysis. It is worth noting that it is possible to describe differences in the structures of provincial economies by comparison of income components. If personal income is broken down to show the proportional amounts received by residents according to broad industrial sources,⁵¹ there is provided "one means of getting at sources of some of the observed differences in the interstate behaviour of personal income."⁵² In considering the findings of the first empirical analysis of this study, it may be instructive to compare the various income components by provinces.

The eighth independent variable is personal income per capita, and is designated X_9 (Personal Income). The measure of income for this variable is averaged over three-year periods centred on the decennial years of this study, 1941, 1951, and 1961. Also, in conformity with the previous discussion, the income data are deflated to 1957 constant

⁵¹That is, Labour, Property, Farm, Non-Farm and Transfer Incomes.

⁵²Hanna, *op. cit.*, p. 98.

dollars through the use of implicit price indexes for Personal Expenditure on Consumer Goods and Services.⁵³ The income data find their source in the relevant D.B.S., *National Accounts, Income and Expenditure* publications. Table LI in Appendix B gives the data and sources in detail.

The ninth independent variable is number of dependents per 100 actual work force members, and is designated X_{10} (Number of Dependents). Dependency is construed as the sum of all persons outside the actual work force regardless of age. The actual work force is the sum of all persons, at a given time, who are employed or seeking employment.⁵⁴ This measure of dependency is less precise than the previous variables, since the data for actual work force accrue only from information for a specific week. It can be argued, however, that this measure provides a more realistic measure of actual dependency than gross population counts of all those persons outside the ages of 15 to 65 years. The data for this variable are computed from the decennial *Census of Canada*, and are shown in Table LII of Appendix B.

Variables X_{11} (Grants to School Boards) and X_{12} (Non-Property Tax Revenues). While the provinces use many of the same types of taxes, variations in tax structures are considerable. These result from the singular accommodations of each province to its social, economic, and political environment which ultimately produce a unique

⁵³Three-year averages of price indexes centred on $\overline{1941}$, $\overline{1951}$, and $\overline{1961}$. Each central year is indicated by a bar.

⁵⁴D.B.S., *Labour Force* (Ottawa: Queen's Printer, 1960), pp. 2 - 3 for the precise definition.

tax structure in each province.⁵⁵ Ratliff investigated the degree of centralization of tax powers in the United States with the measure, proportion of state and local educational revenues from the state.⁵⁶ He found a significant tendency for the states with least ability (measured by personal income per pupil) to have the greatest degree of centralization of tax powers. He also found some tendency for a positive relationship between the degree of centralization and effort, measured by the per cent of personal income spent on public school current expenses. Miner attempted to use the measure, proportion of state and local tax receipts from taxes other than those on property, but found, in a preliminary analysis, a very high negative correlation between this variable and a measure similar to that used by Ratliff.⁵⁷ In this study, the degree of centralization of tax powers is assessed by variable X_{11} (Grants to School Boards), per cent of school board revenues from provincial sources.⁵⁸ A further variable, designated as X_{12} (Non-Property Tax Revenues), is included to assess the influence of different tax structures on education expenditures, and is per cent of non-property tax revenues to total revenues.⁵⁹ The data

⁵⁵ Advisory Commission on Intergovernmental Relations, *op. cit.*, p. 7.

⁵⁶ Charles E. Ratliff Jr., "Centralization, Ability, and Effort in School Finance," *National Tax Journal*, Vol. 13 (March, 1960), pp. 41 - 44.

⁵⁷ Miner, *op. cit.*, pp. 85 - 86. The measure was, state revenues as a fraction of total revenues.

⁵⁸ That is, proportion of current school board revenues from provincial grants.

⁵⁹ Total revenues include school board current revenues and apparent provincial revenues, that is, provincial expenditures less grants to school boards.

sources for each of these variables are found in the D.B.S. Education Division reports, and are reported in detail in Tables LIII and LIV of Appendix B.

Variable X_{13} (Primary Industry). It may be anticipated that the educational level of the population is partly reflective of the occupational structure. The presumed influence is that the proportion of skilled and professional workers in the population is directly related to the demand for formal education, especially at the secondary level. Swanson used a measure of the business and professional workers in the population and related it to school quality with little effect.⁶⁰ Shapiro found the per cent of labour force engaged in non-agricultural employment strongly related to higher per pupil expenditures in the southern states of the United States, and indicated that this measure was related to the degree of urbanization.⁶¹ In this study, the twelfth independent variable is per cent of labour force in primary industries,⁶² and is designated as X_{13} (Primary Industry). The data for this variable are found in the *Census of Canada* reports. Details of this variable are given in Table LVI of Appendix B.

Variables For Which Data Were Unavailable. It was anticipated that a measure of the amount of debt service, indicative of a fixed money commitment and presumed to be inversely related to education

⁶⁰Swanson, *op. cit.*

⁶¹Sherman Shapiro, "Some Socio-Economic Determinants of the Expenditures for Education" *Comparative Education Review*, Vol. 5 (1962), p. 164.

⁶²Primary industries are construed as Agriculture, Hunting, Fishing, Trapping, Logging, Mining, and Quarrying.

expenditures, would be included in this study. Hirsch attempted to measure this variable's influence indirectly with the per cent increase in public school pupils over a six-year period. His presumption was that higher debt charges would be found in young and rapidly growing areas, but he found no significant relationship.⁶³ Miner proposed to use a debt service variable but was unable to collect sufficient data.⁶⁴ In Canada, data on debt service are only available for the year 1961 for all provinces, while data for the earlier years are available only on a partial basis.⁶⁵ This variable could not, therefore, be entered into this study.

It was noted previously that the provinces vary in the structures of their school systems, particularly in terms of their provisions for denominational schools. Denominational or separate schools refer to publicly conducted elementary and secondary schools which are established and administered by singular religious groups. Cheal has suggested five categories of provincial school structure which may be placed on a continuum ranging from a multiple denominational system to a single public school system.⁶⁶ The most pertinent measure of these different school system structures would be the per cent of pupils in

⁶³Werner Z. Hirsch, "Determinants of Public Education Expenditures," *National Tax Journal*, Vol. 23 (March, 1960), pp. 34ff.

⁶⁴Miner, *op. cit.*, p. 96n.

⁶⁵Capital charges data for 1941 and 1951 are available only for Quebec, Ontario, Manitoba, Saskatchewan, and Alberta. D.B.S. *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1959), Table 29.

⁶⁶Cheal, *op. cit.*, p. 34.

A.D.A. in separate or denominational schools. There are no data on separate or denominational school enrolments in Canada. Cheal developed his thesis on the proportion of teachers in separate or denominational school systems, for which data are available only in recent years. The influence of different school system structures on education expenditure levels among the provinces of Canada cannot, therefore, be assessed in this study.

Policy or Political Variables

The theoretical model of determinants of education expenditures suggests a number of Political variables as indicative of Policy determinants. Unfortunately, there are relatively few statistics available for these variables in Canada. While the situation has markedly improved in recent years, a number of provincial Departments of Education deserve censure for their continued intractable attitudes towards responsibility for the collection of comparative data. The lack of comparative statistics will become evident in this section.

Variable X_{14} (Enrolments Beyond Leaving Age). The thirteenth independent variable is per cent of total enrolments beyond statutory leaving ages in public elementary and secondary schools, and is designated X_{14} (Enrolments Beyond Leaving Age). It has long been evident that the costs of educational services provided for secondary school pupils are higher than those for elementary pupils.⁶⁷ The influence of the variable, per cent of pupils in secondary grades, has not always been as marked as expected when introduced into statistical analyses

⁶⁷ Paul R. Mort, *State Support for Public Education* (Washington: American Council on Education, 1933), p. 245.

of the determinants of education expenditures.⁶⁸ The theoretical model advanced in this study precludes use of this variable and suggests instead a measure of pupils in school beyond the statutory leaving ages, as indicative of Effort. The sources of data for this variable are found in the D.B.S. Education Division reports, and are reported in detail in Table LVI of Appendix B.

Variable X₁₅ (Number of Teachers). A number of indicators of teacher characteristics deemed related to levels of education expenditures could be derived. Salary levels, which may be considered partially indicative of qualifications and experience, have been used in previous studies of determinants. Pupil-teacher ratios, and qualifications and experience of teachers, are further possible indicators of teacher characteristics. In this study, these indicators are deemed to be determinants rather than consequents of the levels of education expenditures.

The most useful comparative measure of teacher qualifications is the number of teachers with a university degree. Data are not available for this measure in 1941, nor for Quebec in any year. This measure could not be included in the analysis. It is possible to introduce a measure of variable pupil-teacher ratios in this study, but the measure is weak. The D.B.S. Education Division, working with data collected from provincial Education Department reports and its own questionnaires, publishes statistics on the number of teachers. It is, however, a gross figure that includes all full-time teaching

⁶⁸Werner Z. Hirsch, *Analysis of the Rising Costs of Public Education* (Washington: Joint Economic Committee, 1959); and Shapiro, *op. cit.*

personnel with the exception of superintendents and inspectors.⁶⁹ It includes, therefore, unstated numbers of counsellors, supervisors, librarians, and non-teaching principals who cannot properly be considered as teachers in the calculation of precise pupil-teacher ratios. While this weakness is being corrected in recently published data, the pupil-teacher ratios used in this study are exaggerated. Variable X_{15} (Number of Teachers) is the number of teachers per 100 pupils in A.D.A. in public elementary and secondary schools.⁷⁰ The data, together with statements of sources, are given in Table LVII of Appendix B.

Variables X_{16} (School Size) and X_{17} (School District Size).

The proposition that economies of scale exist for schools in a manner akin to that of industry has enjoyed some popularity. The analogy is not necessarily a valid one. Increased school size, or consolidation of districts, is often associated with growing costs for pupil transportation and very much wider offerings of educational services, such as expanded course offerings and counselling services. In the result, savings due to declining costs in one area are often dissolved with expansion in another.⁷¹ As intervening variables between density-urbanization and education expenditures, the size of school and size of school district are important influences. In this study, the

⁶⁹D.B.S., *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1959), p. 67.

⁷⁰Data for Quebec do not include independent school teachers.

⁷¹For an analysis of the high costs of rural schools in the United States, relative to quality of schooling, see, Finis Welch, "Measurement of the Quality of Schooling," *American Economic Review*, Vol. LVI (May, 1966), pp. 379 - 392.

fifteenth independent variable is number of schools⁷² per 5000 pupils in A.D.A. in public elementary and secondary schools, and is designated X_{16} (School Size). The average number of pupils in A.D.A. in public elementary and secondary schools per school district⁷³ is the sixteenth independent variable, and is designated as X_{17} (School District Size). The data of each of these variables find their sources in the reports of the D.B.S. Education Division. Tables LVIII and LIX of Appendix B show the data and their sources in detail.

Variable X_{18} (Teacher Salaries). The use of a measure of teacher salaries in studies of determinants of education expenditures is often discarded as this measure tends to correlate strongly with measures of income. Hirsch, for instance, found highly significant relationships between salary levels and education expenditures, but the salary measure and per capita income measure were themselves so highly inter-correlated that they were, in effect, statistically the same measure in different forms.⁷⁴ The theoretical model of determinants developed in this study resolves this difficulty by concentrating attention upon the logical, rather than the statistical, difference between these two measures. Miner used an index of salaries paid to beginning teachers with an undergraduate degree and found

⁷²Includes all denominational and non-denominational schools under provincial control and supervision.

⁷³School districts are equated with school boards. The number of school boards in the province, excluding local boards within larger units and including school districts under an official trustee or trustees, make up the number of school districts.

⁷⁴Miner, *op. cit.*, p. 50, commenting on Hirsch.

that this index varied in direct proportion to variations in school expenditures.⁷⁵ Miner used this index as indicative of the variable costs of similar teacher services. Gross measures of salaries are bound to correlate highly with income measures. The pertinent question is not the comparison of gross salaries nationally, rather it is the comparison of the levels of provincial salaries relative to provincial income levels. In this manner the singular costs of teacher services in each province may be assessed. The teacher salary measure used in this study has been developed upon the concept of Swanson's Professional Socio-Economic Ratio.⁷⁶ This measure is constituted as the ratio of median income of family heads⁷⁷ to average teacher salaries.⁷⁸ A ratio less than one indicates that the average instructional salary is higher than the median family income for the province, and is indicative of teachers being accorded a greater "societal esteem".⁷⁹ In this manner, account is taken of differential provincial income levels and the relative position of teacher salaries to the income levels of the provinces. Variable X_{18} (Teacher Salaries) is the teacher salary index. The data for this variable are found in the D.B.S. Education Division reports and the *Census of Canada* reports. Details of this variable are provided in Table LX of Appendix B.

⁷⁵*Ibid.*, p. 101.

⁷⁶Austin D. Swanson, "A Missing Concept in Theories of School Finance," *Educational Administration Quarterly*, Vol. 1 (Spring, 1965), pp. 48 - 51.

⁷⁷Swanson used "median family income" - data for which are not available in Canada.

⁷⁸For details of sources and methods of computation, refer to the footnotes of Table LX in Appendix B.

⁷⁹Swanson, *op. cit.*, p. 51.

Variable X₁₉ (State Aid). State grants for education have been intended to serve four major functions: the stimulation of local spending, the equalization of educational opportunities, the promotion of efficiency in specific expenditure functions, and the provision of local tax relief.⁸⁰ Basically, state grants are designed to increase expenditures. Renshaw found that state grants systematically led to higher per pupil expenditures.⁸¹ A study by James failed to show a notable correlation between the amount of state aid per pupil and expenditures per pupil.⁸² His study indicated that variations in per pupil expenditures among individual school districts tended to decline as aid per pupil rose. Miner worked with two measures of state aid, equalization and general purpose grants, in an extensive study of determinants of education expenditures among 23 states in the United States. His analysis showed that state aid patterns acted to reduce the impact of local variations in income and other local factors, thus performing an equalization function within states.⁸³

The concern of this study is the extent to which state grants act as determinants of education expenditures. In view of the wide variations among provinces in state aid patterns, it would have been

⁸⁰Charles S. Benson, "State Aid Patterns," in Jesse Burkhead, ed., *Public School Finance* (Syracuse: Syracuse University Press, 1964), pp. 205 - 206.

⁸¹Edward F. Renshaw, "A Note on the Expenditure Effect of State Aid to Education," *The Journal of Political Economy*, Vol. 68 (1960), p. 174.

⁸²Thomas H. James, "School Revenue Systems in Five States," cited in Miner, *op. cit.*, p. 59.

⁸³Miner, *op. cit.*, p. 137.

desirable to include two variables in the analysis that were indicative of the major forms of state aid. It was intended to use a measure of the per cent of total state aid that is equalization aid, that is, grants based on a measure of local resources or ability to pay for education services. Also, it was intended to use a measure of the per cent of total state aid that is special purpose aid, defined as grants which may be spent only on specific designated objects of functions.⁸⁴ The attempt to measure these variables proved fruitless. Data for the second variable, special purpose aid, were largely non-existent over the time period covered by this study. For the first variable, equalization aid, an attempt was made to calculate data for this measure from the material collected by K. Grant Crawford.⁸⁵ It was not possible to make the vital distinction between uniform grants and equalization grants when both were included in a Foundation Programme, so the attempt was discontinued. Since it was not possible to include variables indicative of different patterns of state aid in this study,⁸⁶ the eighteenth independent variable is simply, state aid per pupil in

⁸⁴Benson, *op. cit.*, p. 208.

⁸⁵K. Grant Crawford, *Provincial School Grants, 1941-61* (Toronto: Canadian Tax Foundation, 1962).

⁸⁶Wilfred J. Brown (Canadian Teachers' Federation) wrote: "Two or three years ago I attempted to classify Canadian school grant schemes according to purpose (general or specific) and method of distribution (flat or equalizing) as part of an exercise to assess the degree to which provincial school grant schemes accomplish equalization . . . For some provinces, this proved to be an impossible task. The results were then submitted to the various departments of education for comments and filling in of gaps. The overall results were somewhat spotty and were never published." *Letter* to the author, May 9, 1966.

A.D.A. in constant 1957 dollars, and is designated as X_{19} (State Aid). The data for this variable are found in the D.B.S. Education Division reports, and are given in Table LXI of Appendix B.

Variables For Which Data Were Unavailable. Mention has already been made of the lack of data for variables indicative of different patterns of state aid, and for the number of teachers with a university degree. It was anticipated that the measure, number of high school credit units, would be included in this study. Data were not available. Hirsch used this measure as one of six indicators comprising an index of scope and quality of education services.⁸⁷ His rationale was that this measure would be indicative of the quality of the teaching programme, and his total index proved to be a significant determinant of education expenditure.

Another important dimension of general staff characteristics is the number engaged in auxiliary services provided to school pupils, such as counselling, health, and librarians. In his analysis of the costs of education, Hirsch indicated that the costs of auxiliary services had risen from near zero in 1900 to about \$1.5 billion in 1958.⁸⁸ When he introduced an indicator of this factor into a regression analysis of the determinants of education expenditures, his results were not significant.⁸⁹ Miner worked with the variable, number

⁸⁷Werner Z. Hirsch, "Determinants of Public Education Expenditures," *National Tax Journal*, Vol. 23 (March, 1960), p. 34.

⁸⁸Werner Z. Hirsch, "The Costs of Public Education," in Charles S. Benson, ed., *Perspectives on the Economics of Education* (Boston: Houghton Mifflin Company, 1963), p. 153.

⁸⁹Werner Z. Hirsch, *Analysis of the Rising Costs of Public Education* (Washington: Joint Economic Committee, 1959).

of full-time employees in auxiliary services per pupil, and found it, "the most important determinant of both total and local expenditures per pupil."⁹⁰ The explanatory power of this variable was weakened somewhat by the fact that it had about the same relationship to expenditures as other measures of income. The theoretical model of determinants developed in this study provides a resolution of this difficulty, but data was not available in Canada, except for 1961 and Quebec was excluded in that year.

A further issue flowing from the given model of determinants is the degree to which local school district decision-making units are free to determine their own levels of education expenditures. Miner has suggested that the simple measure of dependence or independence of other government bodies for school districts may be indicative of fiscal autonomy. Developing an idea of Margolis, Miner hypothesized that dependency will lead to higher spending,⁹¹ but found in his analysis that, "fiscally dependent school systems tend to spend less."⁹² It may be suggested, then, that a province with a high proportion of fiscally dependent districts will tend to spend less on education. Again, data for this variable are not available.

⁹⁰ Miner, *op. cit.*, p. 101.

⁹¹ *Ibid.*, pp. 86 - 87.

⁹² *Ibid.*, p. 105.

THE APPROACH AND THE TECHNIQUES

For each of the nineteen variables selected for use in this study, data were collected on a province-by-province basis for each of the years involved: 1941, 1951, and 1961.⁹³ The derived values for each of these variables are shown in the Reference Tables of Appendix B in this study. When reference is made to Canada totals, it is to be noted that these concern only the ten provinces and exclude the Yukon and the Northwest Territories.

The data for the independent variables were classified as Non-Policy or Policy variables in conformity with the theoretical model of determinants of education expenditures.

The values for all the variables were punched onto I.B.M. cards and programmes were designed to enable the various statistical techniques to be effected by the computer.

The empirical analysis is undertaken in two distinct parts. The first part is concerned with the combined analysis of all provinces. In this part, an examination of the ability of various sets of independent variables to explain the variation in education expenditures is made, together with an analysis of the importance of these variables taken separately. In terms of these results, the second part of the empirical analysis is concerned with an examination of the apparent sources of differences in public education expenditures among the provinces of Canada. The second part is concerned, therefore, with inter-provincial comparisons.

⁹³Where the original data were given in school-years, adjustments were made to a calendar-year basis. The adjustments were made by averaging the data for the two school-years adjacent to the calendar-year concerned.

Combined Analysis of All Provinces

The first part of the analysis involved the investigation of determinants of current expenditures per pupil in public elementary and secondary schools, X_1 (Education Expenditures). The investigation involved the application of multiple regressions and factor analyses upon each of the two major theoretical categories of determinants of education expenditures, Non-Policy and Policy, and the dependent variable X_1 . The several phases of these analyses are detailed below, and the findings are reported in Chapter IV.

Simple Correlations for X_1 (Education Expenditures) and Independent Variables. The first phase involved the computation of simple correlation coefficients between the dependent variable X_1 and each of the values of the independent variables in each of the Non-Policy and Policy classifications.

Stepwise Regressions for X_1 and Non-Policy Independent Variables. The second phase of the study involved a series of multiple regressions which were computed for the Non-Policy independent variables and the dependent variable X_1 , for 1941, 1951, and 1961. The method of analysis used was the stepwise multiple regression procedure developed by Efroymsen.⁹⁴ This procedure fits the regression function by the normal method of least squares. It proceeds by adding one variable to the prediction equation at a time, adding that variable which accounts for the largest proportion of the remaining variation of the dependent variable. The procedure, therefore, provides a number of intermediate

⁹⁴ M. A. Efroymsen, "Multiple Regression Analysis," Chapter 17, Anthony Ralston and Herbert S. Wilf, eds., *Mathematical Models for Digital Computers* (New York: John Wiley and Sons, 1960), pp. 191 - 203.

regression equations as well as the complete multiple regression equation. A further advantage of the stepwise procedure is that it will operate with an underfit matrix. Given, for example, an N of 10 and twelve independent variables, the stepwise procedure will select the best eight predictors without computer overflow. In essence, the stepwise procedure begins with a simple regression and then shifts into a series of multiple regressions with the addition of further predictor variables. It provides, then, serial sets of independent variables to explain the variance of the dependent variable.

The second phase concerned the community of factors associated with Non-Policy determinants of education expenditures. It sought to determine the singular effects of these determinants, in the three distinct time periods, upon the dependent variable X_1 (Education Expenditures). The Non-Policy determinants included independent variables number X_2 to X_{13} inclusive. Since the number of independent variables (twelve) exceeded the N of ten, the consequent correlation matrices were under-fitted. As mentioned above, the stepwise procedure handled the excess and generated selection of the eight best predictors, in each of the three time periods, from the complex of twelve independent variables. Hence, of the original twelve independent variables, eight variables were selected in each of the periods, 1941, 1951, and 1961. This phase resulted in a total of twenty-four regressions.

Stepwise Regressions for X_1 (Education Expenditures) and All Policy Independent Variables. The third phase of the study involved a series of multiple regressions which were computed for the relationships

between the dependent variable X_1 and all Policy independent variables. The method of analysis used was the stepwise procedure as outlined previously. This phase concerned the community of factors associated with Policy determinants of education expenditures, and used independent variables number X_{14} to X_{19} inclusive. Since only six independent variables were used, the correlation matrices were not under-fitted, and there were produced eighteen regressions.

Stepwise Regressions for X_1 (Education Expenditures) and Four Non-Policy Independent Variables. The second phase of the analysis, stepwise regressions for X_1 (Education Expenditures) and all Non-Policy independent variables, produced three unique sets of eight Non-Policy predictor variables for 1941, 1951, and 1961. An examination of the results revealed that four of the independent variables were significant contributors to the explanation of the variance of the dependent variable in each year. To achieve comparability in the prediction equations over time, further multiple regressions were computed using these four uniform independent variables in each of the years, 1941, 1951, and 1961. The four variables were: X_7 (Roman Catholic Population), X_8 (Income Distribution), X_9 (Personal Income), and X_{13} (Primary Industry). The introduction of fewer variables into the multiple regression functions effected more degrees of freedom, especially important for significance tests in this study.⁹⁵ Again, the use of four identical variables in each year provided a firmer basis for inductive interpretations of the results. This additional analysis used twelve regressions.

⁹⁵For a discussion of the importance of significance tests and the uses made of these tests in this study, refer to the following chapter.

Stepwise Regression for X_1 (Education Expenditures) and Three Policy Independent Variables. The third phase of the analysis, stepwise regressions for X_1 (Education Expenditures) and all Policy independent variables, produced three unique sets of six Policy predictor variables for 1941, 1951, and 1961. Again, to achieve comparability in the prediction equations over time, three uniform variables were selected, on the basis of significance levels, to be applied in each of the three time periods. Further multiple regressions were computed using these three uniform independent variables. The variables were: X_{15} (Number of Teachers), X_{16} (School Size), and X_{18} (Teacher Salaries). This additional analysis produced nine regressions.

Factor Analyses of Nine Non-Policy Independent Variables. In the previous phases concerning Non-Policy independent variables, the results showed that personal income per capita, X_9 , exerted a dominant influence on levels of education expenditures in each year. The strength of this influence masked the effects of other Non-Policy independent variables. In an attempt to discover the relationships among Non-Policy independent variables, multiple regression relationships were computed with X_9 (Personal Income) as the dependent variable and the remaining eleven Non-Policy independent variables. The measure of dependency, X_{10} (Number of Dependents), and the measure of income distribution, X_8 (Income Distribution), emerged as the dominant predictors of levels of personal income per capita. The results are not reported in this study since this type of reduction does not reveal the interrelationships among the Non-Policy variables which affect the relative positions of these variables in the stepwise multiple regressions.

Since the major concern was to develop insights into these inter-relationships, it was decided to use factor analyses of the Non-Policy independent variables in each of the years, 1941, 1951, and 1961. As there are twelve Non-Policy independent variables, and ten provinces, and factor analysis cannot operate with an underfit matrix, three variables had to be eliminated. The particular technique used was the method of multiple factor solution.⁹⁶ Results from a preliminary analysis with unrotated principal axes factor solutions for each year showed that the complexity of inter-relationships was not usefully reduced since they generated general factor solutions involving most independent variables. Hence, multiple factor solutions were preferred in order to reduce the complexity and avoid general factors.⁹⁷ This phase of the study involved three factor analyses.

Factor Analyses of Six Policy Independent Variables. This phase of the analysis was identical to the previous phase, except that the factor analyses were applied to the six Policy independent variables in 1941, 1951, and 1961.

Income Elasticities. The final phase of the first part of the empirical analysis concerned the estimation and discussion of national elasticities of expenditures for education with respect to personal income per capita. Elasticities were derived for each of the three decennial periods, using the income net regression coefficients produced in previous phases.

⁹⁶For a more complete statement of reasons for the choice of this method, refer to the following chapter.

⁹⁷Harry H. Harman, *Modern Factor Analysis* (Chicago: The University of Chicago Press, 1960), p. 112.

Inter-Provincial Comparisons

The first part of the analysis involved the investigation of determinants of current expenditures per pupil in public elementary and secondary schools, X_1 , among the provinces of Canada in 1941, 1951, and 1961. The second part involved the examination of inter-provincial differences in specific variables, selected on the basis of the findings of the multivariate analyses conducted in the several phases of the first part of the analysis. The four phases of this part of the analysis are detailed below, and the findings are reported in Chapter V.

Per Pupil Education Expenditures. The first phase involved the description and discussion of inter-provincial differences in levels of current expenditures per pupil in A.D.A. in public elementary and secondary schools, among the provinces of Canada. A major focus of attention was on inter-provincial differences in terms of provincial indexes. Provincial indexes are developed by expressing each of the provincial per pupil expenditure data as a percentage of the national expenditure in the same year.

Per Pupil Expenditures and Personal Income. The second phase involved the description and discussion of inter-provincial differences in levels of personal income per capita and per pupil education expenditures. The results of the multiple regression analyses in the first stage showed that personal income per capita in constant 1957 dollars, X_9 , exerted a dominant influence on levels of per pupil expenditures, X_1 (Education Expenditures). Again, a major focus of attention was on differences in terms of relative provincial index

levels. Comparisons were made with the findings of related research studies carried out previously in Canada.

Per Pupil Expenditures and Non-Policy Determinants. The third phase involved the description and discussion of inter-provincial differences in levels of selected Non-Policy or Socio-Economic determinants and per pupil education expenditures. The findings of the multivariate analyses in part one of the study were applied in the selection of Non-Policy variables for this phase. Again, provincial indexes for each of the selected variables provided the main focus of attention.

Per Pupil Expenditures and Policy Determinants. The fourth phase was identical to the third phase except that Policy, or Political, determinants were compared inter-provincially.

SUMMARY

The theoretical model of determinants of education expenditures developed in Chapter II provided the logical basis for the selection of variables for the empirical phase of this study. In this chapter, there has been identified one dependent variable and eighteen independent variables. The eighteen independent variables are composed of twelve Non-Policy or Socio-Economic determinants and six Policy or Political determinants, in conformity with the demands of the theoretical model. The selection of independent variables was limited by the availability of data. A complete statement of the variables, their sources of data, and their methods of computation is provided in the reference tables of Appendix B.

A large portion of the data has as its source the decennial *Census of Canada* and reports of the D.B.S. Education Division. Part of the data has as its source the various Annual Reports of provincial Departments of Education. Whatever weaknesses are intrinsic to these data are carried over into this study, but no attempt is made to attribute results to possible errors in these underlying data.

The approach to the empirical analysis is divided into two parts. The first part involves the investigation of determinants of current expenditures per pupil in public elementary and secondary schools, X_1 . This investigation is to be achieved by the application of multiple regressions and factor analyses upon each of the two major theoretical categories of determinants of education expenditures, Non-Policy and Policy, and the dependent variable X_1 (Education Expenditures). This part of the empirical study is composed of eight separate phases of analysis. The first phase involves simple correlations. The second, third, fourth, and fifth phases involve the use of stepwise multiple regressions, the next two phases are concerned with factor analyses, and the final phase concerns income elasticities. Part one, therefore, involves the use of multivariate statistical techniques in the investigation of determinants of educational expenditures per pupil among the provinces of Canada in 1941, 1951, and 1961.

The second part of the empirical study involves the description and discussion of inter-provincial differences in specific variables, selected on the basis of the results of the multivariate analyses of the first part. The second part is composed of four separate phases of analysis. The first phase involves the examination of per pupil

education expenditures. The second phase concerns per pupil education expenditures and personal income. The third and fourth phases involve the examination of selected Non-Policy determinants and Policy determinants respectively. The major technique used in this part of the empirical analysis is inter-provincial comparisons in terms of provincial indexes of variables.

The findings of part one of the empirical analysis are reported in the following chapter, Chapter IV, while the examination of inter-provincial differences, part two of the empirical analysis, is given in Chapter V.

CHAPTER IV

THE FINDINGS: (I) COMBINED ANALYSIS OF ALL PROVINCES

The findings of part one of the empirical phase of this study, which involve the investigation of determinants of current expenditures per pupil in elementary and secondary schools, X_1 , are given in this chapter. The presentation of the findings is organized on the basis of the several phases of the statistical study detailed in the previous chapter. In the following chapter (Chapter V), the findings of part two of the empirical analysis, comparisons of inter-provincial differences for selected variables, are given. The relevance and nature of the study have been indicated (Chapter I). A suggested model of determinants of education expenditures has been developed (Chapter II) as a logical basis for the selection of variables for the empirical stages of the study. The selected variables, and the techniques employed in the empirical stages, have been advanced in the previous chapter (Chapter III). In Table II, overleaf, there is provided a list of the variables used in this study, each with its identifying number.

SIMPLE CORRELATIONS FOR X_1 (EDUCATION EXPENDITURES)

AND INDEPENDENT VARIABLES

While multivariate procedures are the main form of analysis in this part of the study, the simple correlation coefficients between independent variables and the dependent variable merit an initial commentary.

TABLE II
SUMMARY OF VARIABLES

<u>Dependent Variable</u>	
X ₁	- current expenditures per pupil in A.D.A. in public elementary and secondary schools in constant 1957 dollars

<u>Independent Variables</u>	
<u>Variables Reflecting Non-Policy or Socio-Economic Factors</u>	
X ₂	- per cent of total population within statutory school-age limits
X ₃	- per cent of population in school-age limits enrolled in public schools
X ₄	- per cent of population living in urban centres of 10,000 or more
X ₅	- index of migration
X ₆	- per cent of population with 9 or more years formal education
X ₇	- per cent of population Roman Catholic
X ₈	- wage-earner income distribution index
X ₉	- personal income per capita in constant 1957 dollars
X ₁₀	- number of dependents per 100 actual work force members
X ₁₁	- per cent of school board revenues from provincial sources
X ₁₂	- per cent of total revenues from non-property taxes
X ₁₃	- per cent of labour force in primary industry
<u>Variables Reflecting Policy or Political Factors</u>	
X ₁₄	- per cent of pupils enrolled beyond statutory leaving age
X ₁₅	- number of teachers per 100 pupils in A.D.A.
X ₁₆	- number of schools per 5000 pupils in A.D.A.
X ₁₇	- average number of pupils per school district
X ₁₈	- teacher salary index
X ₁₉	- state aid per pupil in constant 1957 dollars

An immediate, and recurring, problem in this study is that of the significance of the computed statistics. Since the study is designedly confined to the ten provinces of Canada, fairly substantial correlation coefficients are required to establish probable realistic associations with particular sets of values, other than associations generated largely on the basis of chance. It is obvious that a straight line fitted to two observations will pass precisely through both. With an N of 10 in this study, a correlation coefficient must be .6319 to be considered significant at the 0.05 level, and .7646 to be significant at the 0.01 level.¹ The necessarily small number of provinces imposes severe restrictions on the importance that can be attached to computed statistics. Fisher, however, has noted that:

It is not true . . . that valid conclusions cannot be drawn from small samples; if accurate methods are used in calculating the probability, we thereby make full allowance for the size of sample, and should be influenced in our judgment only by the value of the probability indicated.²

With respect to Fisher's latter point, it is important to note that the heuristic nature of this study justifies its intention to consider results that are even less significant than the experientially-determined, usual critical levels of 0.01 and 0.05. Tippett has argued that,

in a new field where there is little previous knowledge of experiment, it may well be worth while following up differences and effects that are on the 0.01 or even 0.02 level of significance.³

¹Ronald A. Fisher and Frank Yates, *Statistical Tables for Biological, Agricultural and Medical Research* (London: Oliver and Boyd, 1963), p. 63.

²Ronald A. Fisher, *Statistical Methods for Research Workers* (New York: Hafner Publishing Company, 1958), p. 195.

³L. H. C. Tippett, *The Methods of Statistics* (New York: John Wiley and Sons, 1952), p. 99.

Non-Policy Independent Variables

The simple correlations between the Non-Policy independent variables and the dependent variable X_1 (Education Expenditures) are given in Table III. It is noteworthy that only three of the variables have simple correlation coefficients with the dependent variable which do not approach the 0.05 level of significance in any one year: X_3 (School-age Enrolment), X_7 (Roman Catholic Population), and X_{13} (Primary Industry). Although these variables are not significant in any year, the decreasing influence of X_{13} (Primary Industry), and the unstable effects of X_3 (School-age Enrolments), are conspicuous. The fact that each of these variables moves towards a zero correlation with the dependent variable in 1961 may be explained as a tendency for these measures to evolve towards a national equilibrium proportion, hence reducing their variability.

The simple correlation coefficients for each of the remaining Non-Policy variables exhibit stability of direction (that is, persistence of similar sign throughout the overall period 1941 - 1961) and largely similar influences throughout the three time periods. The only noticeable exception is X_5 (Migration) which shows an expanding influence from 1941 to 1961. This is an anticipated result as the Canadian population has shown increasing mobility during the post-war period. The association of X_{11} (Grants to School Boards) and X_{12} (Non-Property Tax Revenue) with the dependent variable is somewhat uneven, rising to significant levels only in 1951.

Very substantial influences are made by X_2 (School-age Population), X_4 (Urbanization), X_6 (Population Education Levels), X_8

TABLE III
SIMPLE CORRELATIONS OF NON-POLICY INDEPENDENT
VARIABLES AND THE DEPENDENT VARIABLE X_1^a
1941, 1951, 1961

Independent Variables ^a	1941	1951	1961
X_2	-.722#	-.723#	-.790#
X_3	.266	.283	-.031
X_4	.728#	.676#	.753#
X_5	.463	.565	.691#
X_6	.809#	.760#	.756#
X_7	-.472	-.462	-.427
X_8	-.808#	-.874#	-.819#
X_9	.927#	.963#	.934#
X_{10}	-.930#	-.791#	-.796#
X_{11}	-.587	-.633#	-.486
X_{12}	-.670#	-.695#	-.544
X_{13}	-.407	-.330	-.089

^aFor details of variables refer to Table II.

#Significant at the 0.05 level or better.

(Income Distribution), X_9 (Personal Income), and X_{10} (Number of Dependents). The per cent of variance of the dependent variable X_1 (Education Expenditures) explained by these variables averages around 66 per cent. The lowest variance is 46 per cent (X_4 [Urbanization] in 1951), and the highest variance is 93 per cent (X_9 [Personal Income] in 1951). It is apparent that these variables are significantly associated with variability in education expenditures, when considered independently.

Policy Independent Variables

The simple correlation coefficients between Policy independent variables and the dependent variable X_1 (Education Expenditures) are given in Table IV. The table shows that the correlation coefficients tend to become increasingly significant from 1941 to 1961. Substantial influences are exerted by X_{14} (Enrolment Beyond Leaving Age), X_{18} (Teacher Salaries), and X_{16} (Number of Schools). The level of significance of each of these variables in each year is near or better than the 0.05 level. The effects of these variables are generally firm and follow the anticipated directions of influence. In this regard, it will be recalled that the teacher salary index (X_{18}) as constructed for this study provides higher indices for lower salaries relative to median provincial incomes. Hence, the anticipated direction of association with X_1 (Education Expenditures) is negative. The negative influence of X_{16} (School Size) has been argued previously (*supra*, p. 74). It was proposed that fewer schools, resulting from increased school size, caused increased spending for auxiliary services and expanded course offerings.

TABLE IV
SIMPLE CORRELATIONS OF POLICY INDEPENDENT VARIABLES
AND THE DEPENDENT VARIABLE X_1^a
1941, 1951, 1961

Independent Variables ^a	1941	1951	1961
X_{14}	.647#	.631#	.639#
X_{15}	-.422	.112	.084
X_{16}	-.630	-.739#	-.645#
X_{17}	.030	.497	.323
X_{18}	-.611	-.622	-.817#
X_{19}	.152	.597	.725#

^aFor details of variables refer to Table II.

Significant at the 0.05 level or better.

The strongly expanding positive influence of X_{19} (State Aid) is particularly noteworthy. The per cent of variance of X_1 (Education Expenditures) associated with state aid expands from 2 per cent in 1941 to 53 per cent in 1961. Neither of the two remaining variables is significant in any year, and their influences are unstable. The effects of X_{17} (School District Size) are constantly positive, but very uneven in size and much below the 0.05 level of significance. The unstable influence of X_{15} (Number of Teachers) is due, partly, to the weakness of the measure itself (*supra.*, p. 73) and to lessening variability among the provinces. With the exception of this variable, all Policy variables exhibit stability of directions in the overall analysis.

STEPWISE REGRESSIONS FOR X_1 (EDUCATION EXPENDITURES)

AND ALL NON-POLICY INDEPENDENT VARIABLES

The second phase of this part of the empirical analysis employed the stepwise multiple regression procedure to determine relationships between the dependent variable X_1 (Education Expenditures) and the first major class of influencing factors, Non-Policy or Socio-Economic independent variables.

Multiple Regression Coefficients

The important question is the ability of various sets of independent variables to explain the variance of the dependent variable. Additionally, it is important to determine those independent variables which do not make notable contributions in the analysis. Once discovered, these variables may be removed so effecting more degrees of freedom, which are particularly important for significance tests.

Regarding the significance to be attached to the computed multiple regression coefficients, two procedures are followed in this study. First, the tendency for small numbers of observations to produce inflated coefficients of multiple correlation is corrected by the use of the adjustment equation for squares of the multiple coefficient of correlation outlined by Ezekeil and Fox.⁴ This equation "shrinks" the obtained multiple R to give an unbiased estimate of the exact variance most probably associated with particular sets of values

⁴Mordecai Ezekeil and Karl A. Fox, *Methods of Correlation and Regression Analysis* (New York: John Wiley and Sons, 1959), p. 301.

of independent variables in the universe.⁵ Usually, unadjusted multiple regression coefficients become larger with the addition of independent variables into the multiple regression equation. Adjusted coefficients, however, occasionally produce lower adjusted coefficients with the addition of independent variables. When this occurs, it is an indication that the addition of the last variable fails to contribute to the explanation of the variance of the dependent variable. Hence, adjusted multiple regression coefficients help to determine those independent variables which do not notably contribute to the analysis.

The problem of significance, however, is more properly resolved by the "F" ratios generated by the stepwise multiple regression procedure. Adjustments for the small number of cases are implicit in the analysis of variance table,⁶ thus the significance levels of the multiple coefficients of correlation are indicated by the relevant "F" ratio tests.

As mentioned in the previous chapter, the number of Non-Policy independent variables (twelve) exceeds the N of ten in this study, causing the correlation matrices to be underfitted. The stepwise regression procedure handles the excess by selecting the eight best predictor variables from the community of twelve independent variables. Hence, four independent variables are automatically eliminated in each of the years, 1941, 1951, and 1961.

The results of the regression analyses relating to levels of the independent variable X_1 (Education Expenditures) and the Non-Policy

⁵*Ibid.*

⁶*Ibid.*, p. 302.

independent variables for the three time periods are reported in Table V. The table may be read in the following manner. In 1941, 86.4 per cent of the variation in current expenditures per pupil in public elementary and secondary schools in Canada is associated with the variation in the first independent variable, X_{10} (Number of Dependents); when two independent variables are used the proportion explained becomes 90.9 per cent, and so on. Since the statistical analyses provide no more than a mathematical description of the interrelation of sets of predictor variables and the dependent variable in three distinct time periods, different combinations of predictor variables in each year are to be expected. In consequence, of the original twelve Non-Policy independent variables, the following variables were eliminated, in each of their respective years, by the action of the stepwise multiple regression procedure in selecting the best eight predictors: X_2 (School-age Population), X_6 (Population Education Level), X_9 (Personal Income), and X_{11} (Grants to School Boards) in 1941; X_6 (Population Education Level), X_{11} (Grants to School Boards), X_{12} (Non-Property Tax Revenues), and X_{13} (Primary Industry) in 1951; and X_2 (School-age Population), X_3 (School-age Enrolments), X_4 (Urbanization), and X_{12} (Non-Property Tax Revenues) in 1961. A partial reason for the failure of these variables to contribute to the analysis may be found in the inter-correlation matrices of Table XXXV in Appendix A. An examination of this table reveals that each of these variables has substantial simple correlations with one or more of the variables that are included in the analysis.⁷

⁷For example, in 1941 (Table XXXV), excluded variable X_2 has a simple correlation of .795 with included variable X_7 ; similarly, X_6 correlates -.808 with X_{10} ; X_9 correlates -.902 with X_{10} ; and X_{11} correlates .945 with X_{12} .

TABLE V

RANK ORDERS OF NON-POLICY INDEPENDENT VARIABLES OBTAINED
BY THE STEPWISE MULTIPLE REGRESSIONS RELATING TO
LEVELS OF THE DEPENDENT VARIABLE X_1
1941, 1951, 1961

Rank Order	Independent Variables ^a	Computed R	Corrected R_c^b	Cumulative Per Cent of Variance Accounted For by R_c^2
1941				
1	X_{10}	.9296	.9296	86.42
2	X_7	.9586	.9535	90.89
3	X_8	.9707	.9622	92.59
4	X_{12}	.9776	.9663	93.37
5	X_3	.9816	.9667	93.45
6	X_4	.9930	.9852	97.08
7	X_5	.9986	.9952	99.16
8	X_{13}	.9990	.9945	98.92
1951				
1	X_9	.9626	.9626	92.66
2	X_8	.9755	.9724	94.57
3	X_{10}	.9823	.9768	95.43
4	X_2	.9864	.9796	95.97
5	X_4	.9909	.9836	96.76
6	X_5	.9958	.9908	98.16
7	X_3	.9998	.9993	99.88
8	X_7	1.0000	1.0000	100.00
1961				
1	X_9	.9340	.9340	87.23
2	X_{13}	.9515	.9450	89.37
3	X_8	.9654	.9553	91.26
4	X_6	.9709	.9639	92.91
5	X_5	.9819	.9672	93.56
6	X_{11}	.9950	.9887	97.75
7	X_{10}	.9987	.9974	99.49
8	X_7	1.0000	1.0000	100.00

^aFor details of variables, see Table II, p. 92.

^bCorrected by application of shrinkage formula for small sample as given in, Mordecai Ezekeil and Karl A. Fox, *Methods of Correlation and Regression Analysis* (New York: John Wiley and Sons, 1959), p. 301.

The data of Table V reveal that an overwhelming influence is exerted by X_{10} --number of dependents per 100 actual work force members--in 1941, and by X_9 --personal income per capita--in 1951 and 1961. Each of these variables accounts for at least 86 per cent of the variance of the dependent variable in its respective periods. With such singular influences, diminishing returns quickly set in for the addition of further independent variables to the regression equations. The use of all eight independent variables in the regression equations produces an adjusted multiple regression coefficient of .9945 in 1941, and 1.000 in 1951 and 1961. Since it is rarely practicable to employ more than four or five predictor variables,⁸ the unusually high proportions of the variance in the dependent variable accounted for by all eight of the predictor variables are to be regarded with caution.

The "F" ratio levels of significance for each of the unadjusted multiple regression coefficients of Table V are given in Table XXXVII of Appendix A. With the exception of the last (eighth) coefficient, each of the unadjusted multiple regression coefficients is significant at the 0.05 level or better.

Net Regression Coefficients

The relationship between the dependent variable and each of the independent variables is of particular importance. This relationship may be judged from an analysis of the net regression coefficients. Since the stepwise multiple regression procedure generates a serial

⁸ Andrew R. Baggaley, *Intermediate Correlation Methods* (New York: John Wiley and Sons, 1964), p. 54.

number of regression equations, it is more profitable to attend to the significance of the net regression coefficients in the overall analysis, rather than to concentrate on the final regression equations. This is especially true for the final regression equations in this analysis which apparently account for at least 99 per cent of the variance of the dependent variable. Such near perfect relationships, with the use of eight independent variables, are to be regarded with particular prudence.

The signs of the individual net regression coefficients are important. Should the sign of a coefficient be "wrong", that is, the reverse of the expected direction of influence, it is indicative of that variable acting as a "suppressant" in the multiple regression analysis.⁹ Usually, it is necessary to consider a "wrong" sign only if the net regression coefficient is significant at the 0.05 level or better. The heuristic nature of this study, as mentioned previously (*supra.*, p.93) suggests that "wrong" signs of net regression coefficients at the 0.2 level of significance could be taken into account.

Table VI contains the data for significance levels and signs of each of the net regression coefficients in the three time period analyses of this phase of the study.

⁹"An interesting paradox of multiple correlation . . . is that it is possible to increase prediction by utilizing a variable which shows no, or low, correlation with the criterion, *provided* it correlates well with a variable which does correlate with the criterion . . . Such a variable has been termed a 'suppressant'." Quinn McNemar, *Psychological Statistics* (New York: John Wiley and Sons, 1962), pp. 186 - 187. Additional reference is contained in, J. P. Guilford, *Fundamental Statistics in Psychology and Education* (New York: McGraw-Hill Book Company, 1956), pp. 403ff, and Chapter 19.

TABLE VI

THE LEVEL OF SIGNIFICANCE^a AND SIGN OF EACH OF EIGHT NON-POLICY
NET REGRESSION COEFFICIENTS IN EACH OF EIGHT STEPWISE MULTIPLE
REGRESSIONS RELATING TO LEVELS OF THE DEPENDENT VARIABLE X_1 ^b
1941, 1951, 1961

Independent Variables ^b	1st ^c	2nd ^d	3rd ^e	4th ^f	5th ^g	6th ^h	7th ⁱ	8th ^j
1941								
X_{10}	-.001	-.001	-.01	-.3	-.2	-.05	-.02	-.2
X_7		-.1	-.05	-.05	-.1	-.05	-.05	-.2
X_8			-.2	-.2	-.4	-.2	-.1	-.3
X_{12}				-.3	-.2	-.2	-.1	-.3
X_3					-.5	-.1	-.05	-.2
X_4						-.2	-.05	-.3
X_5							.2	.3
X_{13}								k
1951								
X_9	.001	.01	.01	.02	.05	.02	.01	m
X_8		-.1	-.01	-.05	-.05	-.05	-.02	-m
X_{10}			.2	.2	.3	.8	-.3	-m
X_2				-.3	-.2	-.6	-.3	-m
X_4					-.3	-.1	-.01	-m
X_5						.2	.02	m
X_3							-.05	-m
X_7								-m
1961								
X_9	.001	.001	.05	.1	-.9	-.2	-.2	-m
X_{13}		.2	.1	.05	.05	.02	.01	m
X_8			-.2	-.1	-.1	-.05	-.02	-m
X_6				.2	.2	.1	.05	m
X_5					.4	.05	.05	m
X_{11}						-.05	-.05	-m
X_{10}							.1	m
X_7								-m

^aThe level of significance is equal to, or less than, that shown. The values for P were taken from, Ronald A. Fisher and Frank Yates, *Statistical Tables for Biological, Agricultural and Medical Research* (London: Oliver and Boyd, 1963), p. 46.

^bFor details of variables refer to Table II, p. 92.

^c8 degrees of freedom. ^d7 degrees of freedom. ^e6 degrees of freedom.
^f5 degrees of freedom. ^g4 degrees of freedom. ^h3 degrees of freedom.
ⁱ2 degrees of freedom. ^j1 degree of freedom. ^kis greater than .9.

^m100 per cent of variance accounted for.

Variable X_2 (School-age Population). The only year that variable X_2 , per cent of total population within statutory school-age limits, appears is 1951, occurring first in the fourth regression with a low (-.3) significance. The relationship is negative indicating that larger proportions of school-age children are associated with lower per pupil education expenditures. This variable is a partial measure of the burden of dependency. Evidence suggests that wherever this burden is high, there will be relatively lower per pupil education expenditures (*supra.*, pp. 63 - 64). Since this variable enters only into the 1951 regressions, at a relatively low level of significance, it will be excluded from the fourth phase of the analysis.

Variable X_3 (School-age Enrolment). Variable X_3 , per cent of population within school-age limits enrolled in public schools, enters the 1941 analysis at the fifth regression, and the 1951 analysis with the seventh regression. The expected relationship between this variable and levels of education expenditures is positive. It is anticipated that higher proportions of school-age enrolments are partially a function of expanded education services reflected in higher per pupil expenditures. While the simple correlation coefficients, from Table III, page 95, confirm this direction of influence, the net regression coefficients for this variable in Table VI are negative. Since the simple correlation coefficients between this variable and the dependent variable are low (.266, .285, and -.031), X_3 is apparently acting as a suppressant variable in the multiple regression analyses. Inspection of the inter-correlation matrices in Table XXXV of Appendix A shows that this variable correlates substantially, in a negative direction, with

X_7 (Roman Catholic Population) in 1941. The 1951 relationship is difficult to discern other than an apparent association between X_3 (School-age Enrolment) and X_2 (School-age Population) in that year. Since X_3 (School-age Enrolment) adds little to the explanation of the variance of the dependent variable (Table V, p. 101) in these two years, and nothing in 1961, it will be dropped from the fourth phase.

Variable X_4 (Urbanization). The multiple regression relationships with X_4 , per cent of population living in urban places of 10,000 or more, are similarly complex. The expected positive influence, that an increase in urbanization will be associated with higher per pupil expenditures, does not occur in the multiple regression results of Table VI, p. 104. The negative signs for this variable's net regression coefficients denote that it is operating as a suppressant. It is not easy to determine, by inspection of the inter-correlation matrices of Table XXXV in Appendix A, those common elements among the independent variables not contained in the dependent variable, that X_4 is operating to suppress. At best, it appears that it is suppressing certain common elements in both X_3 (School-age Enrolment) and X_2 (School-age Population) in order to increase their correlations with X_1 (Education Expenditures) in 1941 and 1951 respectively. Each of these variables is antecedent to X_4 (Urbanization) in the multivariate relationships of 1941 and 1951. Since this variable adds so little to the prediction of levels of the dependent variable, it will be excluded from the fourth phase.

Variable X_5 (Migration). The index of migration appears in each of the three years, but not before the fifth regression. The relationship

is positive, implying that those provinces with considerable out-migrations tend to spend less per pupil for education. The net regression coefficients are not notably significant. Since this variable is a later choice in the stepwise multiple regression analyses, denoting that it adds little to the explanation of the variance of the dependent variable, it will be excluded from the fourth phase.

Variable X_6 (Population Education Level). Variable X_6 , per cent of population with 9 or more years formal education, enters only in the 1961 analysis, at the fourth regression. The sign of its net regression coefficients is positive, providing the anticipated effect that higher per pupil expenditures are associated with increased proportions of the population having achieved better than elementary schooling. Since this variable enters only one annual analysis, it will be excluded from the fourth phase. It is to be noted, however, that this variable has substantial simple correlations with the dependent variable (Table III, p. 95) in each year. The fact that this variable largely fails to enter the multiple regression analyses indicates that it is statistically synonymous with one or more other independent variables. These relationships are explored in the sixth phase of this analysis.

Variable X_7 (Roman Catholic Population). Variable X_7 , per cent of population Roman Catholic, enters the 1941 analysis at the second regression, and the 1951 and 1961 analyses at the final (eighth) regressions. In 1941, X_7 (Roman Catholic Population) is significant at the 0.05 level in four, and at the 0.01 level in two, of the regressions. Its negative signs throughout indicate the anticipated relationship. Higher proportions of Roman Catholics in the population are

associated with lower per pupil expenditures. It is of interest that this variable appears so strongly in the 1941 analysis. It may be that it is fairly strongly related to X_9 (Personal Income), since it contributes so little in the 1951 and 1961 analyses when X_9 (Personal Income) becomes the paramount predictor variable. The relevant simple correlations from Table XXXV of Appendix A tend to confirm this interpretation, but it is unwise to pursue such interpretation by inspection too far. Undoubtedly, the relationships between X_7 (Roman Catholic Population) and other independent variables are complex. Since this variable enters into each of the decennial analyses, and strongly in the 1941 analysis, it will be included in phase four.

Variable X_8 (Income Distribution). Variable X_8 , wage-earner income distribution index, enters into each of the decennial analyses, at least by the third regression. P is notably significant in the 1951 and 1961 regressions. Further, this variable enters into more regressions and has higher significance levels in 1941 than all other independent variables, excepting only X_7 (Roman Catholic Population) and X_{10} (Number of Dependents). There is an inverse relationship with the dependent variable, denoting that a rise in per pupil expenditures is associated with smaller coefficients of variation for provincial income distributions. Insofar as this index is a valid measure of inequality, it may be said that greater inequalities of income distribution are associated with lower per pupil education expenditures. Since this variable enters each of the analyses strongly, it will be included in phase four.

Variable X_9 (Personal Income). Variable X_9 , personal income per capita, enters each of the regressions in 1951 and 1961. The significance levels for this variable are consistently high in 1951, and high for the first three regressions in 1961. To this point the relationship is positive, indicating that higher personal incomes are associated with increased per pupil expenditures. Negative signs appear in the final four 1961 regressions. The appearance of these "wrong" signs is further evidence of the complex relationships among the Non-Policy independent variables. The inter-correlation matrices in Table XXXV of Appendix A illustrate the interdependence of many of the independent variables, particularly with X_9 (Personal Income) and X_{10} (Number of Dependents). These complex relationships are examined in phase six of this analysis.

The fact that X_9 (Personal Income) fails to enter any of the 1941 regressions is notable. There is good reason to believe that X_{10} (Number of Dependents) is acting as a proxy for this variable in the 1941 analysis. The simple correlation coefficients between these two variables, as shown in Table XXXV of Appendix A, substantiate this interpretation since they are consistently high. Since X_9 (Personal Income) contributes so strongly in two of the decennial analyses, and appears strongly related to X_{10} (Number of Dependents), it was decided to include this variable in phase four, and to exclude X_{10} (Number of Dependents).

Variable X_{10} (Number of Dependents). The high significance levels for variable X_{10} , number of dependents per 100 actual work force members, in 1941, provide a restatement of the earlier finding that this

variable exerts an overwhelming influence on levels of education expenditures in that year. There is an inverse relationship between X_{10} (Number of Dependents) and the dependent variable in 1941, providing the anticipated relationship that higher per pupil expenditures are associated with lower dependency ratios. This variable enters the 1951 analysis at the third regression, and the 1961 analysis at the next to last regression. In these regressions, with the exception of the final two in 1951, X_{10} (Number of Dependents) adopts a positive sign. Again, the complexity of relationships among the independent variables is examined in phase six. As mentioned above, X_{10} (Number of Dependents) will be excluded from the fourth phase in favour of X_9 (Personal Income).

Variable X_{11} (Grants to School Boards). Variable X_{11} , per cent of school board revenues from provincial sources, enters only one analysis, 1961, at the sixth regression. The expected relationship with the dependent variable is realized with negative signs, indicating that higher per pupil expenditures are associated with lower proportions of school board revenues from provincial sources. While it is difficult to generalize from such limited results, there is some indication that education expenditures tend to be higher where there is less reliance upon central authorities for revenues. Since this variable enters only one decennial analysis, and not until the third to last regression, it will be excluded from the fourth phase.

Variable X_{12} (Non-Property Tax Revenue). Variable X_{12} , per cent of non-property tax revenues of total revenues, enters only into the 1941 regressions, with relatively low significance levels. The

anticipated inverse relationship is found, providing evidence for the interpretation that higher per pupil expenditures are associated with higher proportions of locally-collected revenues. Although this variable is highly correlated with X_{11} (Grants to School Boards), shown in Table XXXV of Appendix A, it is a stronger indication of the manner in which provincial revenues contribute to total education expenditures¹⁰ in the provinces. This variable is excluded from the fourth phase since it appears only in the 1941 analysis with relatively low significance levels.

Variable X_{13} (Primary Industry). Variable X_{13} , per cent of labour force in primary industry, enters the 1961 analysis strongly at the second regression, and the 1941 analysis at the final regression. The anticipated relationship is an inverse one, with higher proportions of the labour force in primary industry being associated with lower per pupil expenditures. This inverse relationship appears only in the 1941 analysis. In the 1961 analysis, where X_{13} (Primary Industry) is selected as the second predictor variable at generally high significance levels, positive signs for the net regression coefficients indicate that this variable is operating as a suppressant variable. It appears that this variable is acting as a suppressant with X_8 (Income Distribution). The data of Table XXXV in Appendix A show that X_8 (Income Distribution) correlates fairly substantially with X_{13} (Primary Industry) which, in turn, correlates almost zero with the dependent variable. Hence, it could be that there are common elements between

¹⁰Total education expenditures are school board expenditures plus provincial government expenditures, less grants to school boards.

these two independent variables which are not related to the dependent variable. The suppression of these common elements by the introduction of X_{13} (Primary Industry) positively into the 1961 analysis seems to increase the predictive powers of X_8 (Income Distribution) when combined in the multiple regression analyses. The strong performance of X_{13} (Primary Industry) in the 1961 analysis provides reason to include this variable in the fourth phase.

Summary

The second phase of part one of the empirical analysis concerned the investigation of relationships between the dependent variable, X_1 (Education Expenditures), and all Non-Policy independent variables. The stepwise multiple regression technique produced three unique sets of eight Non-Policy independent variables as being associated with levels of the dependent variable in each of the three decennial periods, 1941, 1951, and 1961.

The multiple regression coefficients for each of the three unique sets of predictor variables indicated that X_{10} (Number of Dependents) was the dominant predictor in the 1941 analysis (accounting for 86 per cent of the variance in per pupil expenditures), and that X_9 (Personal Income) was the major predictor variable in the remaining analyses (accounting for 93 and 87 per cent of the variance in per pupil expenditures in 1951 and 1961 respectively). The strength of these relationships left relatively little of the variance in the dependent variable to be explained by the remaining independent variables.

Each of the independent variables was examined in terms of the significance levels of its net regression coefficients, of its signs,

and of its level of selection in the stepwise multiple regression analyses. This examination produced three major findings related to the fourth phase of this analysis.

First, it was found that X_9 , personal income per capita, is the decisive independent variable in 1951 and 1961. In 1941 X_{10} , number of dependents per 100 actual work force members, exerts the predominant influence, but there is reason to believe that this variable is acting as a proxy for the income variable in that year. Hence, X_{10} (Number of Dependents) will be replaced by X_9 (Personal Income) in the fourth phase. Secondly, the following independent variables added little to the overall analyses, and will also be excluded in the fourth phase: X_2 (School-age Population), X_3 (School-age Enrolment), X_4 (Urbanization), X_5 (Migration), X_6 (Population Education Level), X_{11} (Grants to School Boards), and X_{12} (Non-Property Tax Revenue). With the elimination of these variables there will be a significant increase in the degrees of freedom. Again, the intention behind retaining only four of the original twelve Non-Policy independent variables is to assess the utility of a more uniform analysis in each of the time periods. Thirdly, X_7 (Roman Catholic Population) and X_{13} (Primary Industry) will be retained in the fourth phase even though each appeared strongly in only one of the decennial analyses, since each was second-choice predictor variables and possessed generally higher significance levels than any of the other independent variables, excepting only the major predictors, X_9 (Personal Income) and X_{10} (Number of Dependents).

Finally, the examination of the signs of the net regression coefficients revealed the operation of suppressant variables in the

multiple regression analyses. Attempts to discern the relationships among independent variables by inspection of their inter-correlation matrices cannot be entirely successful. In consequence, the sixth phase of this analysis will explore the interrelationships among selected independent variables with factor analytic statistical procedures.

STEPWISE REGRESSIONS FOR X_1 (EDUCATIONAL EXPENDITURES)

AND ALL POLICY INDEPENDENT VARIABLES

The third phase of this part of the empirical analysis employed the stepwise multiple regression procedure to determine relationships between the dependent variable X_1 (Education Expenditures) and the second major class of influencing factors, Policy or Political independent variables.

Multiple Regression Coefficients

The results of the regression analyses relating to levels of the dependent variable X_1 (Education Expenditures) and the Policy independent variables for the three time periods are reported in Table VII, overleaf. Again, the statistical analyses provide no more than a mathematical description of the interrelation of sets of predictor variables and the dependent variable in the three distinct periods. Thus different combinations of predictor variables in each year are to be expected.

The adjusted multiple regression coefficients in Table VII reveal that lower coefficients occur with the additions of the fifth

TABLE VII

RANK ORDERS OF POLICY INDEPENDENT VARIABLES OBTAINED
BY THE STEPWISE MULTIPLE REGRESSIONS RELATING TO
LEVELS OF THE DEPENDENT VARIABLE, X_1^a
1941, 1951, 1961

Rank Order	Independent Variables ^a	Computed R	Corrected ^b R_c	Cumulative Per Cent of Variance Accounted For By R_c^2
1941				
1	X_{14}	.6473	.6473	41.90
2	X_{15}	.8488	.8268	68.36
3	X_{16}	.8822	.8461	71.59
4	X_{19}	.9129	.8659	74.98
5	X_{18}	.9203	.8512	72.46
6	X_{17}	.9263	.8244	68.07
1951				
1	X_{16}	.7387	.7387	54.57
2	X_{15}	.8734	.8563	73.33
3	X_{18}	.9713	.9630	92.74
4	X_{17}	.9734	.9593	92.14
5	X_{14}	.9740	.9527	90.77
6	X_{19}	.9753	.9435	89.05
1961				
1	X_{18}	.8171	.8171	66.75
2	X_{16}	.9082	.8956	80.12
3	X_{15}	.9472	.9315	86.77
4	X_{14}	.9609	.9407	88.50
5	X_{17}	.9622	.9309	86.67
6	X_{19}	.9628	.9142	83.58

^aFor details of variables refer to Table II, p. 92.

^bCorrected by application of shrinkage formula for small samples as given in: Mordecai Ezekeil and Karl A. Fox, *Methods of Correlation and Regression Analysis* (New York: John Wiley and Sons, Inc., 1959), p. 301.

and sixth independent variables in 1941 and 1961, and the fourth and following independent variables in 1951. This indicates that these variables fail to contribute to the analyses. Hence the following independent variables fail to contribute to the regression analyses: X_{17} (School District Size) in any year; X_{19} (State Aid) in 1951 and 1961; X_{14} (Enrolments Beyond Leaving Age) in 1951; and X_{18} (Teacher Salaries) in 1941. In each case, the adjusted multiple regression coefficients for these variables are lower, rather than higher, than their respective antecedent coefficients.

The remaining independent variables account for between 75 and 93 per cent of the variance of the dependent variable X_1 (Education Expenditures) in the three decennial analyses. No one variable shows an overwhelming influence, and the influences of particular variables vary widely throughout the decennial analyses. Substantial influences are made by X_{14} (Enrolments Beyond Leaving Age) in 1941 (accounting for 42 per cent of the variance in per pupil expenditures); by X_{16} (School Size) in 1951 (accounting for 55 per cent of the variance); and by X_{18} (Teacher Salaries) in 1961 (accounting for 67 per cent of the variance). Each of these variables, together with X_{15} (Number of Teachers), exerts influence in more than one of the decennial analyses.

The expanding influence of X_{18} , the teacher salary index, from a non-contributory level in 1941, to the third (1951), then major (1961) predictor of per pupil expenditures is especially noteworthy. It would appear that the teacher salary index is becoming much more closely related to provincial levels of income over time. In effect, the relatively capricious levels of teacher salaries in 1941 have

settled more directly, and more validly, against the levels of personal incomes of the provinces.

The "F" ratio level of significance for each of the unadjusted multiple regression coefficients of Table VII is reported in Table XXXVIII of Appendix A.

Net Regression Coefficients

The specific relationships between the dependent variable and each of the independent variables are, as before, to be judged from the significance levels and signs of their net regression coefficients in the overall analysis. Table VIII contains the data for significance levels and signs for each of the net regression coefficients in the three decennial analyses of this phase of the study.

The signs of the net regression coefficients are not always in the directions expected. Those variables with the "wrong" signs, however, are in no instances significant. The highest significance level for a net regression coefficient with a "wrong" sign is 0.3 (for X_{19} in 1941), while each of the remaining "wrong" signs are at lower levels than 0.6. In consequence, there is no need to be concerned with these incorrect directions of influence in the analyses.

Variable X_{14} (Enrolment Beyond Leaving Age). Variable X_{14} , per cent of pupils beyond statutory leaving ages enrolled in schools, enters the 1941 analysis as the major predictor variable, with a direct relationship with the dependent variable. Hence, higher per pupil expenditures tend to be associated with greater proportions of enrolments beyond statutory leaving ages. While this is revealed in 1941, this variable is not significant in the remaining analyses. This may

TABLE VIII

THE LEVEL OF SIGNIFICANCE^a AND SIGN OF EACH OF SIX POLICY
NET REGRESSION COEFFICIENTS IN EACH OF SIX STEPWISE MULTIPLE
REGRESSIONS RELATING TO LEVELS OF THE DEPENDENT VARIABLE X_1 ^b
1941, 1951, 1961

Independent Variables ^b	1st ^c	2nd ^d	3rd ^e	4th ^f	5th ^g	6th ^h
1941						
X_{14}	.05	.01	.02	.02	.2	.3
X_{15}		-.05	-.2	-.2	-.8	-.8
X_{16}			-.3	-.3	-.3	-.8
X_{19}				-.3	-.3	-.3
X_{18}					-.6	-.6
X_{17}						.7
1951						
X_{16}	-.02	-.01	-.001	-.01	-.01	-.05
X_{15}		.05	.01	.01	.02	.05
X_{18}			-.01	-.01	-.05	-.2
X_{17}				-.6	-.7	k
X_{14}					-.8	-.7
X_{19}						-.7
1961						
X_{18}	-.01	-.01	-.01	-.05	-.05	-.1
X_{16}		-.05	-.02	-.02	-.05	-.1
X_{15}			.1	.2	.3	.4
X_{14}				.3	.4	.8
X_{17}					-.8	-.8
X_{19}						.9

^aThe level of significance is equal to, or less than, that shown. For values for P reference, see footnote a, Table VI, p. 104.

^bFor details of variables refer to Table II, p. 92.

^c8 degrees of freedom. ^d7 degrees of freedom.

^e6 degrees of freedom. ^f5 degrees of freedom.

^g4 degrees of freedom. ^h3 degrees of freedom.

^kis greater than .9.

be imputed to the fact that this variable shows substantial simple correlations (from Table XXXVI of Appendix A) with other independent variables in 1951 and 1961, notably with X_{16} (School Size) and X_{18} (Teacher Salaries) respectively. Since the influence of X_{14} (Enrolment Beyond Leaving Age) is limited to one decennial analysis, it will be excluded from the fifth phase of this analysis.

Variable X_{15} (Number of Teachers). Variable X_{15} , number of teachers per 100 pupils in A.D.A., is a consistent contributor to the analyses, with its strongest levels of significance in 1951. It will be recalled that this variable could not be measured accurately since no allowance could be made for non-teaching and semi-teaching personnel, such as supervising principals and counsellors. The anticipated influence is that lower pupil-teacher ratios will be associated with higher per pupil expenditures. The results for 1951 and 1961 concur with this anticipated direction of influence, but the 1941 results are in the reverse direction. The simple correlation coefficients between X_{15} (Number of Teachers) and the dependent variable X_1 (Education Expenditures) agree with these different directions of influence in their respective years. Thus, the adoption of a negative sign in 1941 does not indicate that X_{15} (Number of Teachers) is acting as a suppressant variable in that analysis. The negative signs in 1941 may be due to the fact that lower overall pupil-teacher ratios accrued in that year from the large numbers of small rural schools in operation at that time. Historically, large numbers of small rural schools are related inversely to per pupil education expenditures. Since X_{15} (Number of Teachers) enters each of the decennial analyses as a significant predictor variable, it will be included in phase five.

Variable X_{16} (School Size). Variable X_{16} , number of schools per 5000 pupils in A.D.A., is a highly significant contributor to the 1951 and 1961 analyses. While it enters the 1941 analysis at the third regression, its contributions are not significant in that year. The signs of the net regression coefficients are in the anticipated negative direction. This inverse relationship denotes that higher per pupil expenditures are associated with smaller numbers of schools. This affords additional evidence for the proposition that, while economies-of-scale may be achieved in certain areas, increasing school-size is usually associated with expanding overall expenditures. This variable will be included in phase five.

Variable X_{17} (School District Size). Variable X_{17} , average number of pupils per school district, is not significant in any of the decennial analyses. The anticipated positive relationship with the dependent variable, denoting that larger school districts are associated with higher per pupil expenditures, is achieved in the simple correlations between these two variables (Table IV, p. 97). The extremely low significance levels for this variable in the multiple regression analyses, not more than 0.6, indicate that it may be safely excluded from the fifth phase.

Variable X_{18} (Teacher Salaries). Variable X_{18} , teacher salary index, is significant in the 1951 and 1961 analyses. While it enters the 1941 regressions, its levels of significance are low (0.6) and it is the second to last choice as a predictor variable. The anticipated inverse relationship with the dependent variable is achieved in each of the decennial analyses. This indicates that the higher the average

teacher salary in relation to median income of family heads, the greater is per pupil education expenditure. It will be recalled that the index, as constructed in this study, gives lower ratios to higher relative teacher salaries. The expansion in the strength of influence for this variable, from 1941 to 1961, has been noted previously. In consequence, it will be included in the fifth phase.

Variable X_{19} (State Aid). Variable X_{19} , state aid per pupil in constant 1957 dollars, is not significant in any of the decennial analyses. It is the last choice predictor variable in 1951 and 1961, and enters the 1941 analysis at the fourth regression with a low level of significance (0.3). The simple correlations between this variable and the dependent variable X_1 (Education Expenditures), from Table IV, page 97, reveal an expansion in its strength of positive association from .152 in 1941 to .725 in 1961. The failure of this variable to contribute significantly in the 1951 and 1961 analyses especially, may be imputed to the fact that it is highly correlated with X_{18} (Teacher Salaries) which is itself a significant contributor in these years (Table XXXVI of Appendix A). Since X_{19} (State Aid) does not contribute in the multiple regression analyses, it will be excluded for the fifth phase of this analysis.

Summary

The third phase of part one of the empirical analysis concerned the investigation of relationships between the dependent variable X_1 (Education Expenditures) and all Policy independent variables. The stepwise multiple regression technique produced three unique sets of six Policy independent variables as being associated with levels of

the dependent variable in each of the three decennial periods, 1941, 1951, and 1961.

The multiple regression coefficients for each of the three unique sets of predictor variables indicated that 42 per cent of the variance in per pupil education expenditures was accounted for by X_{14} (Enrolment Beyond Leaving Age) in 1941, 55 per cent by X_{16} (School Size) in 1951, and 67 per cent by X_{18} (Teacher Salaries) in 1961.

The examination of the significance levels and signs of the net regression coefficients showed that X_{17} (School District Size) and X_{19} (State Aid) failed to contribute in any of the decennial analyses. Variable X_{14} (Enrolment Beyond Leaving Age), while exerting a substantial influence in 1941, failed to contribute significantly in later analyses. It was suggested that this variable had much in common, statistically, with X_{16} (School Size) and X_{18} (Teacher Salaries). The remaining independent variables, X_{15} (Number of Teachers), X_{16} (School Size), and X_{18} (Teacher Salaries), were found to be the major contributing variables to the explanation of the variance in per pupil expenditures in the overall analysis. Each of these variables exhibited stability of direction of influence, and relatively high significance levels. Hence, these three variables will be assessed in phase five in which a more uniform analysis will be applied in each of the decennial periods.

Again, attempts were made to discern relationships among the independent variables by inspection of their inter-correlation matrices. Since this procedure is uncertain, the seventh phase of this analysis will explore these interrelationships with factor analytic statistical procedures.

STEPWISE REGRESSIONS FOR X_1 (EDUCATION EXPENDITURES)

AND FOUR NON-POLICY INDEPENDENT VARIABLES

The fourth phase of this part of the empirical analysis employed the stepwise multiple regression procedure to determine relationships between the dependent variable X_1 (Education Expenditures) and four Non-Policy independent variables. The second phase generated mathematical descriptions of the relationships between the dependent variable and unique sets of Non-Policy independent variables in each of the decennial periods. Examination of the net regression coefficients and the adjusted multiple regression coefficients in these analyses suggested that certain independent variables added little to the explanation of the variance of the dependent variable, and hence could be excluded. The intention of this phase of the empirical analysis is to go beyond the discovered idiosyncratic and irregular mathematical relationships in each of the decennial periods, to seek descriptions which are general and uniform and which use the fewest number of independent variables.

Multiple Regression Coefficients

The results of the regression analyses relating to levels of the dependent variable X_1 (Education Expenditures) and four Non-Policy independent variables for the three decennial periods are given in Table IX. The adjusted multiple regression coefficients for X_7 , per cent of population Roman Catholic, indicate that this variable adds nothing to the 1951 and 1961 analyses, and that it makes a negligible contribution to the 1941 analysis. The negligible 1941 contribution confirms the previous suggestion that this variable is

TABLE IX

RANK ORDERS OF FOUR NON-POLICY INDEPENDENT VARIABLES OBTAINED
BY THE STEPWISE MULTIPLE REGRESSIONS RELATING TO LEVELS
OF THE DEPENDENT VARIABLE X_1 ^a
1941, 1951, 1961

Rank Order	Independent Variables ^a	Computed R	Corrected ^b R_c	Cumulative Per Cent of Variance Accounted For By R_c^2
1941				
1	X_9	.9266	.9266	85.87
2	X_{13}	.9485	.9421	88.75
3	X_8	.9587	.9469	89.66
4	X_7	.9654	.9481	89.89
1951				
1	X_9	.9626	.9626	92.66
2	X_8	.9755	.9724	94.55
3	X_{13}	.9790	.9730	94.67
4	X_7	.9814	.9721	94.49
1961				
1	X_9	.9339	.9339	87.23
2	X_{13}	.9515	.9454	89.38
3	X_8	.9654	.9555	91.30
4	X_7	.9660	.9490	90.06

^aFor details of variables refer to Table II, p. 92.

^bCorrected by application of shrinkage formula for small samples as given in: Mordecai Ezekeil and Karl A. Fox, *Methods of Correlation and Regression Analysis* (New York: John Wiley and Sons, Inc., 1959), p. 301.

fairly strongly related to X_9 , personal income per capita, since X_7 (Roman Catholic Population) now fails to contribute to the analysis with X_9 (Personal Income) operating as the major predictor variable. The remaining three independent variables account for between 90 and 95 per cent of the variance of the dependent variable X_1 (Education Expenditures). Again, the paramount influence of X_9 (Personal Income) is evident as it explains between 86 and 93 per cent of the variance in per pupil expenditures of itself.

While each of the unadjusted multiple regression coefficients for these three variables, in each decennial analysis, is significant at the 0.01 level or better (Table XXXIX in Appendix A), there is not a great deal to be gained in the understanding of the variance of the dependent variable by the addition of independent variables beyond the first, X_9 (Personal Income).

The results do indicate that the application of uniform independent variables to the analysis of the dependent variable in the three decennial periods is worthwhile in terms of generality. The use of three uniform variables (discarding X_7) throughout, in place of three singular independent variables in each decennial analysis, reduces the proportion of the explained variance solely in the 1941 analysis. Comparison of the relevant adjusted multiple regression coefficients from Tables V and IX, pages 101 and 124 respectively, shows that the proportions of variance explained shift from 93 per cent (Table V) to 90 per cent (Table IX) in 1941. Hence, valid generalizations may be drawn from the application of uniform Non-Policy independent variables

as indicators of levels of per pupil education expenditures in the overall period, 1941 to 1961.

Net Regression Coefficients

The significance levels of the net regression coefficients, as given in Table X, indicate that only X_9 (Personal Income) is highly significant in each of the decennial analyses. P for X_7 (Roman Catholic Population) is low in each analysis (0.4 or less), emphasizing the failure of this variable to contribute. X_8 (Income Distribution) has lower significance levels in this analysis compared to the previous analysis of phase two (Table VI, p. 104). It is significant at the 0.1 level in the 1951 analysis, and at the 0.2 and 0.3 levels in the remaining analyses, of this phase. P for X_{13} (Primary Industry) is similarly lower in this phase, with its highest levels in 1941 and 1961. Again, the positive sign for this variable indicates that it is continuing to act as a suppressant variable. The earlier interpretation that it is operating with X_8 (Income Distribution) in this capacity continues to hold in this phase. The significance levels for X_9 (Personal Income) remain high in this phase.

In general, the significance levels of the net regression coefficients, excepting those for X_9 (Personal Income), are lower than those obtained in the second phase. This is an indication of the fact that the application of uniform independent variables, as predictors of per pupil expenditures in three singular periods, provides less authentic conclusions. The efficiency of the stepwise multiple regression procedure is consequently demonstrated, as it generates that particular combination of independent variables which best explains

TABLE X

THE LEVEL OF SIGNIFICANCE^a AND SIGN OF EACH OF FOUR NON-POLICY
NET REGRESSION COEFFICIENTS IN EACH OF FOUR STEPWISE MULTIPLE
REGRESSIONS RELATING TO LEVELS OF THE DEPENDENT VARIABLE X_1 ^b
1941, 1951, 1961

Independent Variables ^b	1st ^c	2nd ^d	3rd ^e	4th ^f
1941				
X_9	.001	.001	.01	.05
X_{13}		.2	.1	.3
X_8			-.3	-.3
X_7				-.4
1951				
X_9	.001	.01	.02	.1
X_8		-.1	-.1	-.1
X_{13}			.4	.4
X_7				-.5
1961				
X_9	.001	.001	.05	.2
X_{13}		.2	.1	.1
X_8			-.2	-.3
X_7				-.8

^aThe level of significance is equal to, or less than, that shown. For values of P reference, see footnote a, Table VI, p. 104.

^bFor details of variables refer to Table II, p. 92.

^c8 degrees of freedom. ^d7 degrees of freedom.

^e6 degrees of freedom. ^f5 degrees of freedom.

the variance in the dependent variable in a particular period of time. It has been shown, in the second phase, that these combinations of predictor variables differ in each of the decennial periods. Hence it is to be expected that the use of uniform independent variables in this phase will necessarily result in less positive findings.

STEPWISE REGRESSIONS FOR X_1 (EDUCATION EXPENDITURES)

AND THREE POLICY INDEPENDENT VARIABLES

The fifth phase of this stage of the empirical analysis is identical to the fourth phase except that three Policy independent variables are to be examined in their relationships with the dependent variable X_1 (Education Expenditures).

Multiple Regression Coefficients

The results of the regression analyses relating to levels of the dependent variable X_1 (Education Expenditures) and three Policy independent variables for the three decennial periods are given in Table XI. The adjusted multiple regression coefficients for the 1951 and 1961 analyses are identical to those obtained in the earlier phase (Table VII, p. 115). The 1941 analysis, however, provides different results. In the earlier phase, the first three independent variables explained 72 per cent of the variance in the dependent variable (Table VII), while the three independent variables used in this phase explain only 60 per cent of the variance. In the 1941 analysis of this phase, the addition of X_{15} (Number of Teachers) lowers the adjusted multiple regression coefficient, indicating that this variable adds nothing to the analysis. With the exception of this variable,

TABLE XI

RANK ORDERS OF THREE POLICY INDEPENDENT VARIABLES OBTAINED
BY THE STEPWISE MULTIPLE REGRESSIONS RELATING TO
LEVELS OF THE DEPENDENT VARIABLE X_1^a
1941, 1951, 1961

Rank Order	Independent Variables ^a	Computed R	Corrected ^b R_c	Cumulative Per Cent of Variance Accounted For by R_c^2
1	X_{16}	.6298	.6298	39.67
2	X_{18}	.8101	.7864	61.84
3	X_{15}	.8259	.7761	60.22
1951				
1	X_{16}	.7387	.7387	54.60
2	X_{15}	.8734	.8563	73.33
3	X_{18}	.9713	.9630	92.74
1961				
1	X_{18}	.8171	.8171	66.75
2	X_{16}	.9082	.8956	80.12
3	X_{15}	.9471	.9315	86.77

^aFor details of variables refer to Table II, p. 92.

^bCorrected by application of shrinkage formula for small samples as given in: Mordecai Ezekeil and Karl A. Fox, *Methods of Correlation and Regression Analysis* (New York: John Wiley and Sons, Inc., 1959), p. 301.

the "F" ratios for each of the unadjusted multiple regression coefficients are significant at the 0.05 level or better (Table XL in Appendix A).

Net Regression Coefficients

The levels of significance, and signs, of the net regression coefficients are reported in Table XII. The very low (0.6) level of significance for X_{15} (Number of Teachers) in the 1941 analysis substantiates the failure of this variable to contribute in this analysis. Apart from this variable, each of the net regression coefficients is significant at the 0.1 level or better in each of the decennial analyses. In general, the significance levels of the net regression coefficients in this phase are higher than those found in the previous analysis (Phase three). This finding is contrary to that for the uniform Non-Policy independent variables in the previous phase. It suggests that the application of uniform Policy independent variables provides more precise results than the use of unique combinations of independent variables in each of the distinct periods. In this case, the superior results may be imputed to the fact that the original cluster of six Policy independent variables was extremely restricted in terms of the availability of data. Further, it was found that X_{17} (School District Size) and X_{19} (State Aid) made no significant contribution in the earlier analysis, and X_{14} (Enrolments Beyond Leaving Age) contributed solely in the 1941 analysis. Of the cluster of six independent variables, then, three made little or no contribution in the first analysis. Hence the use of the remaining three variables alone in this phase, without the

TABLE XII

THE LEVEL OF SIGNIFICANCE^a AND SIGN OF EACH OF THREE POLICY
NET REGRESSION COEFFICIENTS IN EACH OF THREE STEPWISE MULTIPLE
REGRESSIONS RELATING TO LEVELS OF THE DEPENDENT VARIABLE X_1^b
1941, 1951, 1961

Independent Variables ^b	1st ^c	2nd ^d	3rd ^e
1941			
X_{16}	-.1	-.05	-.1
X_{18}		-.1	-.1
X_{15}			.6
1951			
X_{16}	-.02	-.01	-.001
X_{15}		.05	.01
X_{18}			-.01
1961			
X_{18}	-.01	-.01	-.01
X_{16}		-.05	-.02
X_{15}			.1

^aThe level of significance is equal to, or less than, that shown. For values of P reference, see footnote a, Table VI, p. 104.

^bFor details of variables refer to Table II, p. 92.

^c8 degrees of freedom. ^d7 degrees of freedom.

^e6 degrees of freedom.

weakening effects of the three insignificant and redundant variables, produced stronger results.

The signs of the net regression coefficients in this phase concur with the anticipated directions of influence. The exception is X_{15} (Number of Teachers) which has a "wrong" sign in 1941, but this variable is not significant in this year.

The results of this phase again substantiate the proposition that valid generalizations may be drawn concerning the influence of uniform independent variables on levels of per pupil expenditures in the three decennial periods. It was found that the 1951 and 1961 periods were especially amenable to the application of uniform independent variables, but that the proportions of variance of the dependent variable explained declined in 1941. The original six Policy variables, which are unavoidably restricted in range, were satisfactorily resolved as three significant predictor variables. The resolution was satisfactory in the sense that it operated without suppressant variables, hence the influences were in the anticipated directions of effect.

FACTOR ANALYSES OF NINE NON-POLICY INDEPENDENT VARIABLES

The sixth phase of this part of the empirical analysis employs factor analysis of the inter-correlation matrices of the Non-Policy independent variables in order to resolve these into clusters of commonly related variables.

The Technique

The use of factor analytic procedures in this phase is entirely defensible, in terms of the foregoing analyses and within the limits

of present intentions. The concern of the empirical study to this point has been with the determination of relationships between the dependent variable X_1 (Education Expenditures) and different combinations of Non-Policy independent variables. In the several combinations of variables it was found that the actions of suppressant variables, together with indications of redundancies, indicated that many of the independent variables were closely interrelated. The particular patterning of these interrelationships apparently caused certain independent variables to be highly significant contributors in association with one set of variables, yet fail to contribute when associated with a slightly different set of variables. Visual interpretations of the inter-correlation matrices were attempted in order to understand such actions. While this procedure is commonly practised, its success largely depends upon the skill of the interpreter; yet interpretations were made at several points where they were required in order to proceed. It is proposed, in this phase, to explore these interrelationships in a more rigorous manner. Since the essential purpose is to resolve the interrelationships of the independent variables into clusters of commonly related variables, it is appropriate to use the statistical technique of factor analysis.

The paramount purpose of this statistical examination is exploratory. Factor analysis, as Baggaley has pointed out, "is often used in situations where the researcher has relatively little advance knowledge of the domain."¹¹ Guilford has observed that there are

¹¹Andrew R. Baggaley, *Intermediate Correlation Methods* (New York: John Wiley and Sons, 1964), p. 161.

entirely practical reasons for making a factor analysis, "among which is the desire to reduce the number of variables with which one operates."¹² Kendall notes that most science progresses by beginning "with the observations and looking for components in the hope that we may be able to reduce the dimensions of variation and also, that our components may, in some cases, be given a physical meaning."¹³ Regarding the latter point, it is not an intention of this study to seek unique factors which may be given a physical meaning.

This study is exploratory, using factor analysis in the very general sense of its meaning, as a set of methods for analyzing tables of inter-correlations.¹⁴ The particular purpose of this study has been the investigation of determinants of per pupil education expenditures in terms of series of independent variables conceptually developed and derived from previous studies associated with this area. Hence, the study will proceed by making singular factor analyses for sets of independent variables in each of the three decennial periods, rather than by working with a hypothetical correlation matrix developed by averaging each of the distinct decennial correlation matrices. Again, the purpose is to provide mathematical descriptions of the singular inter-relatedness of variables in each of the distinct periods. This particular approach has been the essence of this study. It is from the particular descriptions that attempts have been made at inductive conclusions.

¹²J. P. Guilford, *Psychometric Methods* (New York: McGraw-Hill Book Company, 1954), p. 522.

¹³M. G. Kendall, *A Course in Multivariate Analysis* (London: Charles Griffin and Company, 1957), p. 37.

¹⁴Baggaley, *op. cit.*, p. 96.

While there are a number of different approaches to factor solutions,¹⁵ the multiple factor solution which employs the "simple structure" principles objectively defined by Thurstone,¹⁶ will be applied in this study. The essence of "simple structure" is the meaningful reduction of the complexity of the variables, optimally to a uni-factor solution. Thus parsimony is the basis of "simple structure" and is mathematically derived by the rotation of reference axes.¹⁷ Parsimony is the basis of selecting a preferred solution from the infinitude of possible factor solutions. Since observed phenomena can be described in an immense number of ways which are mutually consistent,¹⁸ particular factor solutions in common with all descriptive techniques are arbitrary and indeterminate. Moulton has noted that,

this illustrates Poincare's thesis that every set of phenomena can be interpreted consistently in various ways, in fact, in infinitely many ways. It is our privilege to choose among the possible interpretations the ones that appear to us most satisfactory, whatever may be the reasons for our choice. If scientists remember that various equally consistent interpretations of every set of observational data can be made, they would be less dogmatic than they often are, and their beliefs in a possible ultimate finality of scientific theories would vanish.¹⁹

To objectify the choice of factor solutions, researchers have devised techniques based on Thurstone's rules for "simple structure". Of these techniques for multiple factor solutions, the quartimax,

¹⁵See, Harry H. Harmon, *Modern Factor Analysis* (Chicago: The University of Chicago Press, 1960), Chapter 6.

¹⁶Guilford, *op. cit.*, p. 508.

¹⁷*Ibid.*, pp. 484ff; and Harman, *op. cit.*, pp. 291ff.

¹⁸Harman, *op. cit.*, p. 291.

¹⁹F. R. Moulton, cited in Harman, *op. cit.*, p. 21.

varimax, and equamax²⁰ methods are variously favoured. The multiple factor programme used in this study provides factor solutions for each of these methods. Usually, the factor solution preferred will be that which seems to be the best parsimonious analytical solution in terms of Thurstone's criteria.

The results obtained for each of these solutions in this phase produced factors which were essentially invariant throughout each of the decennial analyses and each of the different factor solution methods. Since the varimax solution was slightly superior to the others in terms of Thurstone's "simple structure" criteria, it was preferred in reporting the findings of this phase.

The Findings

The results of the varimax solutions for nine Non-Policy independent variables, for the three decennial analyses, are presented in Table XIII. Since the factor analysis cannot operate with an underfit matrix, three of the original twelve Non-Policy independent variables were excluded from this phase. The excluded variables were: X_3 (School-age Enrolments), X_{11} (Grants to School Boards), and X_{12} (Non-Property Tax Revenue). These variables made very limited contributions in the analyses of phase two. For the remaining nine variables, the

²⁰In the *Quartimax* solution, the transformation desired is one which will tend to increase the large factor loadings and decrease small ones for each variable of the original factor matrix. Hence the attempt is to increase the inequalities among the factor loadings. Since *quartimax* emphasizes the simplification of each *row*, or variable, of the factor matrix, *Varimax* concentrates on simplifying the *columns*, or factors, of the factor matrix. *Equamax* works with the *quartimax* and *varimax* results and attempts to equalize the influences of both as a factor solution. See, Harmon, *op. cit.*, pp. 294 and 301.

TABLE XIII

VARIMAX MULTIPLE FACTOR SOLUTIONS FOR NINE NON-
POLICY INDEPENDENT VARIABLES, AND COMMUNALITIES
1941, 1951, 1961

Independent Variables ^a	Factor 1	Factor 2	Factor 3	Communalities
1941				
X ₂	.348	.878	-.125	.907
X ₄	-.800	.021	.574	.970
X ₅	-.179	-.290	.905	.936
X ₆	-.582	-.574	.391	.822
X ₇	.029	.937	.046	.882
X ₈	.854	.110	-.287	.824
X ₉	-.873	-.310	.294	.945
X ₁₀	.929	.297	-.102	.962
X ₁₃	.470	-.213	-.792	.893
	3.709	2.305	2.127	8.140
	41.2%	25.6%	23.6%	90.4%
1951				
X ₂	.454	.783	-.082	.827
X ₄	-.637	-.026	.745	.962
X ₅	-.128	-.298	.919	.950
X ₆	-.584	-.607	.373	.849
X ₇	.073	.937	.051	.885
X ₈	.781	.087	-.510	.878
X ₉	-.836	-.452	.176	.934
X ₁₀	.927	.241	-.153	.941
X ₁₃	.224	-.158	-.939	.956
	3.194	2.244	2.745	8.184
	35.5%	24.9%	30.5%	90.9%
1961				
X ₂	-.754	.531	.012	.851
X ₄	.540	.009	.839	.996
X ₅	.320	-.296	.853	.918
X ₆	.618	-.590	.328	.837
X ₇	-.137	.965	.025	.951
X ₈	-.540	.040	-.764	.877
X ₉	.748	-.320	.556	.971
X ₁₀	-.942	.096	-.150	.918
X ₁₃	.240	-.118	-.935	.946
	3.159	1.777	3.330	8.265
	35.1%	19.7%	37.9%	91.8%

^aFor details of variables refer to Table II, p. 92.

varimax solution has generated three factors which are in large degree invariant throughout the three decennial analyses. The absolute values of the factor coefficients are not of primary importance; it is their signs and relative magnitudes that are especially useful for analysis.

Non-Policy Factor 1. The contributions of the first factor decline in importance from 41.2 per cent in 1941 to 35.1 per cent in 1961. In the 1941 and 1951 analyses, it is the dominant factor. Examination of the signs and relative magnitudes of this factor, from Table XIII, reveals similarities in the relative sizes of the coefficients throughout the three decennial analyses, but that the signs are reversed in the 1961 analysis.

The first factor appears strongly in X_{10} (Number of Dependents), X_8 (Income Distribution), and X_2 (School-age Population) in a positive way, and negative in X_4 (Urbanization), X_6 (Population Education Level), and X_9 (Personal Income) in the 1941 and 1951 analyses. In the 1961 analysis, the signs of these variables are reversed, but this does not alter their relative positions. Hence, those areas with higher proportions of school-age children and dependents, and wider variations in income distribution, are associated with less urbanization, lower population education levels, and lower personal incomes. Larger proportions of the labour force engaged in primary industry are associated with this factor, particularly in 1941. The influence of this variable, X_{13} (Primary Industry), declines in later years.

Non-Policy Factor 2. The contributions of the second factor also decline in importance throughout the decennial analyses, from 25.6 per cent in 1941 to 19.7 per cent in 1961. This factor is composed of very

high coefficients for X_2 (School-age Population) and X_7 (Roman Catholic Population) in positive directions, and high coefficients for X_6 (Population Education Level) in a negative direction. Variables X_5 (Migration) and X_9 (Personal Income) appear strongly in a negative manner also. Thus, those areas with low population education levels, low personal incomes, and relatively high out-migrations, are associated with greater proportions of Roman Catholics and school-age children.

Non-Policy Factor 3. The contributions of the third factor increase in importance, from 23.6 per cent in 1941 to 37.9 per cent in 1961. The third factor appears very strongly in X_{13} (Primary Industry) in a negative manner, and X_4 (Urbanization) and X_5 (Migration) in a positive manner. Variables X_9 (Personal Income) and X_6 (Population Education Level) appear less strongly positively, while X_8 (Income Distribution) appears less strongly negatively. Those areas with high degrees of urbanization and little out-migrations are clearly associated with low proportions of the labour force in primary industry. There is a strong tendency for higher personal incomes, population education levels, and urbanization to be associated with little out-migration, low proportions of workers in primary industry, and less inequality of income distribution.

Conclusion. The factor solutions provide insights into the relationships between nine Non-Policy independent variables. The most obvious relationship developed by the factor solutions concerns X_9 (Personal Income). This variable exerted a dominating influence on the levels of per pupil education expenditures in the previous analyses. In the result, the influences of other independent variables were con-

siderably masked. The factor solutions give important understandings of the different "mixes" of independent variables that operate with X_9 (Personal Income). In this way, it can be inferred that similar combinations of influences will most probably operate with per pupil education expenditures, since X_9 (Personal Income) accounts for an average of 90 per cent of the variance in per pupil education expenditures of itself.

The overall factor solutions suggest that those areas possessing high personal incomes are marked by greater urbanization and less out-migration, higher population education levels and narrower inequalities of income distribution, lower dependency ratios and proportions of school-age children, fewer Roman Catholics and lower proportions of the labour force in primary industries. While this does not prove that higher personal incomes are caused by these factors, it does disclose probable associations of factors that are related to levels of personal income per capita, hence to levels of per pupil education expenditures.

The fact that these generalizations concur with logically anticipated relationships is indicative, in part, of the particular service the application of factor analytic procedures can provide in the examination of socio-economic data. This service has largely been overlooked by research workers in this area.

FACTOR ANALYSES OF SIX POLICY INDEPENDENT VARIABLES

The seventh phase of this part of the empirical analysis employs factor analysis of the inter-correlation matrices of the Policy independent variables in order to resolve these into clusters of commonly

related variables. The purposes of this analysis, and the techniques applied, are identical to those outlined in the previous phase.

The Findings

The results of the varimax solutions for six Policy independent variables in the three decennial analyses are given in Table XIV.

While the results of this analysis are less steady, the patterning of the relationships is again largely similar throughout the three decennial periods.

Policy Factor 1. The first factor is strongly composed of X_{14} (Enrolment Beyond Leaving Age), X_{16} (School Size), X_{18} (Teacher Salaries), and X_{19} (State Aid) in each analysis, but there is a reversal of signs between 1941 and the later periods. In 1951 and 1961, those areas possessing the first factor have higher proportions of enrolments beyond statutory leaving ages, higher amounts of state aid per pupil, fewer schools per 5,000 pupils, and higher teacher salaries. It will be recalled that the teacher salary index as constructed in this study affords higher indices to lower average salaries relative to median incomes of family heads. In 1941, these same variables appear with reversed directions of influence, hence the overall effects are similar. Variable X_{17} (School District Size) appears relatively strongly in the 1941 and 1951 analyses, but fails to contribute in 1961. Its influence, however, in these two analyses is relatively chaotic. The first Policy factor accounts for an average of 42 per cent of the variance, its contribution markedly increasing from 1941 to 1951, and declining thereafter.

TABLE XIV

VARIMAX MULTIPLE FACTOR SOLUTIONS FOR SIX
POLICY INDEPENDENT VARIABLES, AND COMMUNALITIES
1941, 1951, 1961

Independent Variables ^a	Factor 1	Factor 2	Communalities
1941			
X ₁₄	-.709	-.038	.505
X ₁₅	.376	.449	.343
X ₁₆	.225	.940	.933
X ₁₇	.471	-.796	.856
X ₁₈	.936	-.062	.881
X ₁₉	-.575	-.133	.348
	2.124	1.742	3.866
	35.4%	29.0%	64.4%
1951			
X ₁₄	.837	.329	.809
X ₁₅	-.101	.920	.857
X ₁₆	-.658	.502	.685
X ₁₇	.772	-.206	.638
X ₁₈	-.788	.207	.664
X ₁₉	.824	-.352	.803
	3.039	1.416	4.455
	50.6%	23.6%	74.2%
1961			
X ₁₄	.930	.241	.923
X ₁₅	.140	.677	.478
X ₁₆	-.316	.791	.725
X ₁₇	.108	-.762	.592
X ₁₈	-.807	.226	.701
X ₁₉	.911	-.205	.872
	2.476	1.815	4.291
	41.3%	30.2%	71.5%

^aFor details of variables refer to Table II, p. 92.

Policy Factor 2. The second factor is more stable in terms of directions of effect, but less strong in relative magnitudes of the coefficients. The contributions of this factor are fairly stable throughout the three analyses, accounting for around 30 per cent of the variance. Variables X_{15} (Number of Teachers) and X_{16} (School Size) appear strongly in a positive manner. The negative variables are weaker, with X_{17} (School District Size) appearing notably in 1941 and 1961, and X_{19} (State Aid) contributing influence in 1951 and 1961. X_{18} (Teacher Salaries) advances from a virtually zero influence in 1941 to some degree of positive influence thereafter. Hence, those areas possessing this factor are marked by more schools per 5000 pupils and superior teacher-pupil ratios. Further, fewer pupils per school district, slightly lower amounts of state aid per pupil, and slightly lower teacher salaries are associated with this factor.

Conclusion. The major predictor variables for levels of per pupil education expenditures were found to be X_{15} (Number of Teachers), X_{16} (School Size), and X_{18} (Teacher Salaries), in the previous analyses. The overall factor solutions suggest that superior pupil-teacher ratios are associated with more schools per 5000 pupils and smaller school districts. Again, insofar as the pupil-teacher measure is valid, these results afford further evidence that consolidation of schools and school districts has not necessarily been associated with lower pupil-teacher ratios. It would seem that the proliferation of small schools in a profusion of districts, which certainly marked the earlier periods, at least possessed the advantage of lower pupil-teacher ratios. The overall factor solutions also suggest generalizations regarding associations of variables with X_{18} (Teacher Salaries). It would seem that those

areas possessing higher teacher salaries are differentiated by fewer schools per 5000 pupils, greater proportions of enrolments beyond statutory leaving ages, and increased amounts of state aid per pupil. Again, this does not prove that higher teacher salaries are a consequence of these factors. Since X_{18} (Teacher Salaries) is a major predictor of levels of per pupil education expenditures, it may be inferred that these factors are also related to levels of per pupil expenditures.

The restricted number of Policy independent variables available for analysis in this study limits the service that the factor analytic procedure is capable of providing.

INCOME ELASTICITIES

Since studies of determinants of education expenditures often refer to elasticities of expenditures for education with respect to income,²¹ it is useful to examine the elasticities produced by the analyses of this study. Income elasticity is the percentage change in per pupil education expenditures associated with a one per cent change in income. The procedure used in computing elasticities involves the use of the income net regression coefficients produced in previous phases of this study.²² The computed elasticities of current expenditures per pupil with respect to personal income per capita are provided in Table XV.

²¹Chapter II contains a description of several of the research findings in this area.

²²The computations were made as follows, using the 1941 data with one independent variable as an example:

$$\begin{aligned} E_{e.y} &= \text{income net regression coefficient } X \text{ (mean value of income /} \\ &\quad \text{mean value of expenditures)} \\ &= .1628 \times (\$789.7 / \$138.6) \\ &= .1628 \times 5.69 \\ &= .926 \end{aligned}$$

from: Sherman Shapiro, *An Analysis of the Determinants of Current Public and Societal Expenditures per Pupil in Elementary and Secondary Schools* (unpublished doctoral dissertation, University of Chicago, 1962), p. 68.

TABLE XV

ELASTICITIES OF CURRENT EXPENDITURES PER PUPIL WITH
RESPECT TO PERSONAL INCOME PER CAPITA IN CONSTANT
1957 DOLLARS, AND COMPUTATION DATA
1941, 1951, 1961

Number of Independent Variables ^a	Net Regression Coefficients (1)	S. E. of Column (1) (2)	Computed Elasticity (3)	Range of Estimate (4)
1941				
1	.1628	.0234	.926	.736 - 1.059
4	.1355	.0442	.771	.519 - 1.022
1951				
1	.1680	.0167	.999	.899 - 1.098
4	.0945	.0384	.561	.333 - .789
1961				
1	.2228	.0301	1.116	1.052 - 1.387
3 ^a	.1584	.0570	.865	.554 - 1.118

^aThis is the number of independent variables in the regression equation from which the net regression coefficient with respect to income was taken. Only when the net regression coefficient was significant at the 0.1 level or better was it used (Table X, p. 127). The fourth regression equation in 1961 produced an income net regression coefficient at the 0.2 level of significance, hence the third equation was used in this computation.

The elasticities given in Table XV are derived from the results of phase four of this analysis. The computed point elasticities (column 3) are subject to sampling variability qualifications. Since they have been computed from income net regression coefficients (column 1), which have their own standard errors (column 2), it is possible to provide the range of estimation (column 4). Thus, for example, the 1941 point estimate elasticity of .926 can be considered valid within the range .736 to 1.059 (computed net regression coefficient plus and minus one standard error) at the 0.01 level.

In all instances except one, the computed elasticities are less than one. Even when the range of estimation is taken into account (column 4), the larger proportions of possible estimations are below one. The exception is 1961 where, with one variable (income), the income elasticity is slightly greater than one. In general, the computed elasticities increase from 1941 to 1961. The reduction evident in each year with the addition of independent variables into the regression equations is due, in part, to the influences of the additional variables. The elasticities are largest with the simple regressions between per pupil education expenditures and personal income per capita. The implication from the computed elasticities is that for every one per cent rise in per capita personal income, education expenditures per pupil, nationally, increased by less than one per cent.

The computed elasticities can be compared only with similar research carried out in the United States, since income elasticities for public elementary and secondary current expenditures have not previously been computed in Canada. A summary of comparable United States studies is provided in Table XVI.

TABLE XVI

COMPARISONS OF VARIOUS COMPUTED ELASTICITIES OF EXPENDITURES
FOR EDUCATION WITH RESPECT TO INCOME, BY AUTHOR, UNITS, AND TIME^a

Author	Elasticity	Time	Units
Fabricant	.78	1942	48 states. Current expenditures per capita and per capita personal income
Hirsch	1.09	1900 to 1958	U.S.A. Daily total current expenditures plus debt service per pupil and per capita personal income
Brazer	.729	1953	40 large cities. Current expenditures per capita and median family income
Shapiro	.712 .911	1940 1950	48 states. Current expenditures per pupil and per capita personal income
This study ^b	.926 .999 1.116	1941 1951 1961	10 provinces. Current expenditures per pupil and personal income per capita

^aAdapted from, Shapiro, *op. cit.*, p. 73.

^bFrom Table XV, p. 145.

The results of this study are generally consistent with the findings of comparable United States studies, shown in Table XVI. The dissimilarities throughout the table are due to differences in the definitions of variables, in time periods covered, and in localities of data. Shapiro's elasticities were computed from regression equations involving four independent variables. His results provided income elasticities of .712 for 1940 and .911 for 1950. With the use of four independent variables in this study, the comparable income elasticities are .771 for 1941 and .561 for 1951 (Table XV, p. 145). Differences in the selection and definition of independent variables, other than income, are largely responsible for the lower elasticities of this study. It will be recalled that X_{13} (Primary Industry), one of the four independent variables employed in this study, operated in the multiple regression equations as a suppressant variable. This action is also partly responsible for the lower elasticities of this study provided with the use of additional independent variables. For these reasons, the elasticities reported in Table XVI for comparative purposes are those computed from the simple regression between income and per pupil education expenditures.

Two general conclusions emerge from this examination of Canadian income elasticities with respect to per pupil education expenditures. First, there is evidence to suggest that income elasticity was less than one, decennially 1941 to 1961. Lower elasticities occur in the earlier period, while the later period has elasticities approaching, or slightly over, one. Secondly, the results of this study are largely consistent with the findings of comparable United States studies, given the differences in data, definitions, and time.

SUMMARY

This chapter has given the findings of part one of the empirical analyses, which involved the investigation of determinants of current education expenditures per pupil in public elementary and secondary schools, among the provinces of Canada. The major statistical technique used for the analysis of determinants was the stepwise multiple regression procedure. Factor analysis was employed as a minor technique in the final phases of this analysis. The empirical analyses were organized into several phases based on the theoretical distinction between Non-Policy and Policy determinants of education expenditures. This theoretical distinction guided the selection of variables for the several phases of the analysis. It also enabled the evaluation of certain factors which in previous studies were statistically synonymous. In consequence, these factors could not be fully assessed in their influence on levels of education expenditures. These factors were described as Policy variables in this study. The selection of Policy independent variables was, however, severely constrained by the lack of data.

The initial phases of this part of the analysis generated mathematical descriptions of the unique combinations of Non-Policy independent variables in one analysis, and Policy independent variables in the other, that best explained the variance in levels of per pupil education expenditures in each decennial period, 1941, 1951, and 1961. The next phases sought to go beyond these irregular relationships to assess the application of uniform independent variables, in their relationships with per pupil education expenditures, in each of the

decennial periods. Later phases employed factor analyses of the two sets of independent variables, Non-Policy and Policy, as a means of exploring patterns of relationships. The final phase employed the findings of previous phases to compute income elasticities with respect to per pupil education expenditures.

The empirical analyses of this study are divided into two parts. The first part, the investigation of determinants of per pupil education expenditure levels, has been reported in this chapter. This part constitutes the major focus of this study. The second part of the empirical analysis, the examination of inter-provincial differences in selected variables, is reported in the following chapter.

CHAPTER V

THE FINDINGS: (2) INTER-PROVINCIAL COMPARISONS

The findings of part one of the empirical analysis, which involved the investigation of determinants of current expenditures per pupil in public elementary and secondary schools, have been given in the previous chapter. The findings of part two of the empirical analysis, involving the examination of inter-provincial differences in selected variables, are given in this chapter. The presentation of the findings is organized on the basis of the several phases of part two detailed at the end of Chapter III. Part two of the empirical analysis constitutes the minor focus of attention in this study, whereas part one is the principal feature.

PER PUPIL EDUCATION EXPENDITURES

The statistical measure of education expenditures used in this study is current expenditures per pupil in A.D.A. in public elementary and secondary schools in constant 1957 dollars. Total education expenditures represent the flow of productive factors, or services, provided for elementary and secondary school pupils, the greater part of which is made up of labour inputs. Per pupil education expenditure is a measure of comparative service per student among the separate provinces. The closer, then, that the provincial averages are to the national average, the smaller is the degree of education expenditure disparity among the provinces, and the more balanced is the participation

of the separate provinces in the national development of elementary and secondary school pupils.

Provincial Disparities

Range. The provincial levels of per pupil education expenditures are given in Table XVII, for 1941, 1951, and 1961. An evident feature is the appreciable rise in per pupil education expenditures in each province throughout the overall period, 1941 to 1961. A more important feature of the comparisons is the substantial differences in expenditure levels between the highest and lowest provinces. The inter-provincial range, in absolute terms, increases from \$154 in 1941, to \$174 in 1951, and \$219 in 1961. The relative range,¹ however, declines over the years from 1.08 in 1941, to 0.85 in 1951, and 0.82 in 1961. The inter-provincial range of education expenditures, then, is slightly larger than the national per pupil level in 1941 and decreases thereafter.

Rank. An examination of the data in Table XVII indicates that there is considerable stability in the provincial rankings throughout the three time periods.² This occurs despite differential changes from one year to the other. Newfoundland's expenditures, for example, have virtually doubled from \$65.7 per pupil in 1941 to \$125.5 in 1961, yet it remains the lowest expenditure province. On the other hand, British Columbia retains its position as the highest expenditure

¹The absolute range divided by the mean.

²The coefficients of rank correlation between 1941 and the 1951 and 1961 provincial per pupil expenditures are .95 and .89, both significant at the 0.01 level.

TABLE XVII
LEVELS AND INDEXES OF PER PUPIL EDUCATION EXPENDITURES^a
BY PROVINCES
1941, 1951, 1961

Province (Ranked by 1941 - 61 average education expenditure)	Per Pupil Education Expenditures (constant 1957 dollars)			Indexes (Canada = 100)		
	1941	1951	1961	1941	1951	1961
British Columbia	220.0	270.9	344.4	158.7	146.9	143.2
Ontario	179.5	237.0	285.6	129.5	128.5	118.8
Alberta	160.3	232.7	312.6	115.6	126.1	130.0
Saskatchewan	154.4	217.8	303.6	111.3	118.1	126.2
Manitoba	168.0	195.2	268.0	121.2	105.8	111.4
Canada	138.6	184.4	240.4	100.0	100.0	100.0
Quebec	125.5	169.5	242.4	90.5	91.9	100.8
New Brunswick	114.9	172.8	174.2	82.9	93.7	72.4
Nova Scotia	109.1	140.2	203.8	78.7	76.0	84.6
Prince Edward Island	89.0	110.6	143.5	64.2	59.9	59.6
Newfoundland	65.7	96.8	125.5	47.4	52.4	52.2

^aCurrent expenditures per pupil in A.D.A. in elementary and secondary schools in constant 1957 dollars.

Source: Table XLIII, Appendix B.

province with a 57 per cent increase in expenditures from \$220 in 1941 to \$344.4 in 1961. Expenditure levels in the Prairies and Ontario are persistently above the national average, while the Atlantic provinces and Quebec range below per pupil expenditure levels in the nation as a whole.

Coefficient of Variation. The behaviour of the inter-provincial disparities may be observed, additionally, by comparing their standard deviations as a percentage of the national mean in each year. This measure of relative dispersion, the coefficient of variation, was 33.36 in 1941, dropping to 30.91 in 1951, and rising slightly to 31.36 in 1961. In the relative terms provided by these coefficients of variation, there has been a slight narrowing of inter-provincial differences in per pupil education expenditures throughout the overall period.

Provincial Indexes. Since changes in the dollar amounts of provincial education expenditures all occur in an upward direction, the behaviour of the expenditures of a particular province needs to be judged against a valid standard. A principal standard is provided by expressing each of the provincial per pupil expenditures as a percentage of the national expenditure in the same year. These indexes, or relatives, allow direct comparisons of the changes in per pupil education expenditures of a province relative to the changes in that of the nation. Such comparisons reveal which provinces increased more, and which less, than the average of all provinces in a given year.

The indexes for per pupil education expenditures, detailed in Table XVII, do not reveal uniform patterns of change. The diversity of the patterns is more pronounced since only three time periods are

compared. Despite singular provincial variations, the essential feature from the record of the past three time periods is the persistence of expenditure disparity among the provinces of Canada. The indexes for per pupil education expenditures are charted in Figure 7, page 170. In this Figure, the shaded area, representing the spread in provincial relatives of per pupil expenditures, has narrowed only modestly.

The data from Table XVII, illustrated in Figure 7, show that per pupil expenditure indexes for British Columbia and Ontario, the two highest average expenditure provinces, have markedly declined from 1941 to 1961. Of the three Prairie provinces, Alberta and Saskatchewan have persistently increasing indexes throughout the period, while the Manitoba indexes fall sharply between 1941 and 1951 and increase thereafter. The lower expenditure provinces, Quebec and the Atlantic areas, are very diverse. Quebec indexes tend to parallel the Alberta/Saskatchewan changes, particularly in the more recent period. The indexes for Prince Edward Island decline throughout, while those for Newfoundland and New Brunswick substantially increase in the initial period and fall thereafter, although the Newfoundland decline is negligible. Nova Scotia indexes behave in an opposite manner, dropping initially then rising substantially in the final decade.

Regression. Despite variations in per pupil education expenditures from year to year and from province to province, the persistence of expenditure disparity remains strikingly apparent. There is, however, a suggestion of regression. The modest decline in the coefficients of variation provides a hint of an overall tendency for expenditures to regress toward the national mean. Again, there are broad

tendencies to regression shown by the behaviours of the indexes. The indexes of three of five higher expenditure provinces demonstrate a decline throughout the overall period (British Columbia, Ontario, and Manitoba), while those of three lower expenditure provinces increase (Quebec, Nova Scotia, and Newfoundland). Given these tentative impressions, the fitting of regression lines may provide a statement of the amount of regression to be expected.

Two regression lines have been fitted to the dollar per pupil expenditures for 1951 on 1941 (Figure 5), and 1961 on 1941 (Figure 6). These lines show the average change in provincial expenditures in terms of the dollar deviation from the mean provincial expenditure. Since the regression is positive, the greater percentage increases are found above the mean, the smaller percentage increases below the mean.³ For example, the percentage increase from 1941 to 1951 at Quebec's 1941 level (\$125.5) is 35 per cent, while it is 16 per cent at Manitoba's 1941 level (\$168).

The fit of the regression lines provides, on inspection, an adequate description of the data. The exception occurs only at the lower extreme where the fit is poor for Newfoundland. It is important to note that Newfoundland exhibited high growth rates, on its 1941 expenditure base, of 47 per cent to 1951 and 91 per cent to 1961. By visual impression, the introduction of curve into the linear regression

³The regression line is of the type $Y = a + bX$; where Y denotes the expenditure of the latter year estimated from the former, X denotes the expenditure of the earlier year, and a and b are constants. For 1941 and 1951, the value of a, the Y intercept, is \$14.0, and b, the slope of the regression line, is 1.23. For 1941 and 1961, a is \$28 and b is 1.53.

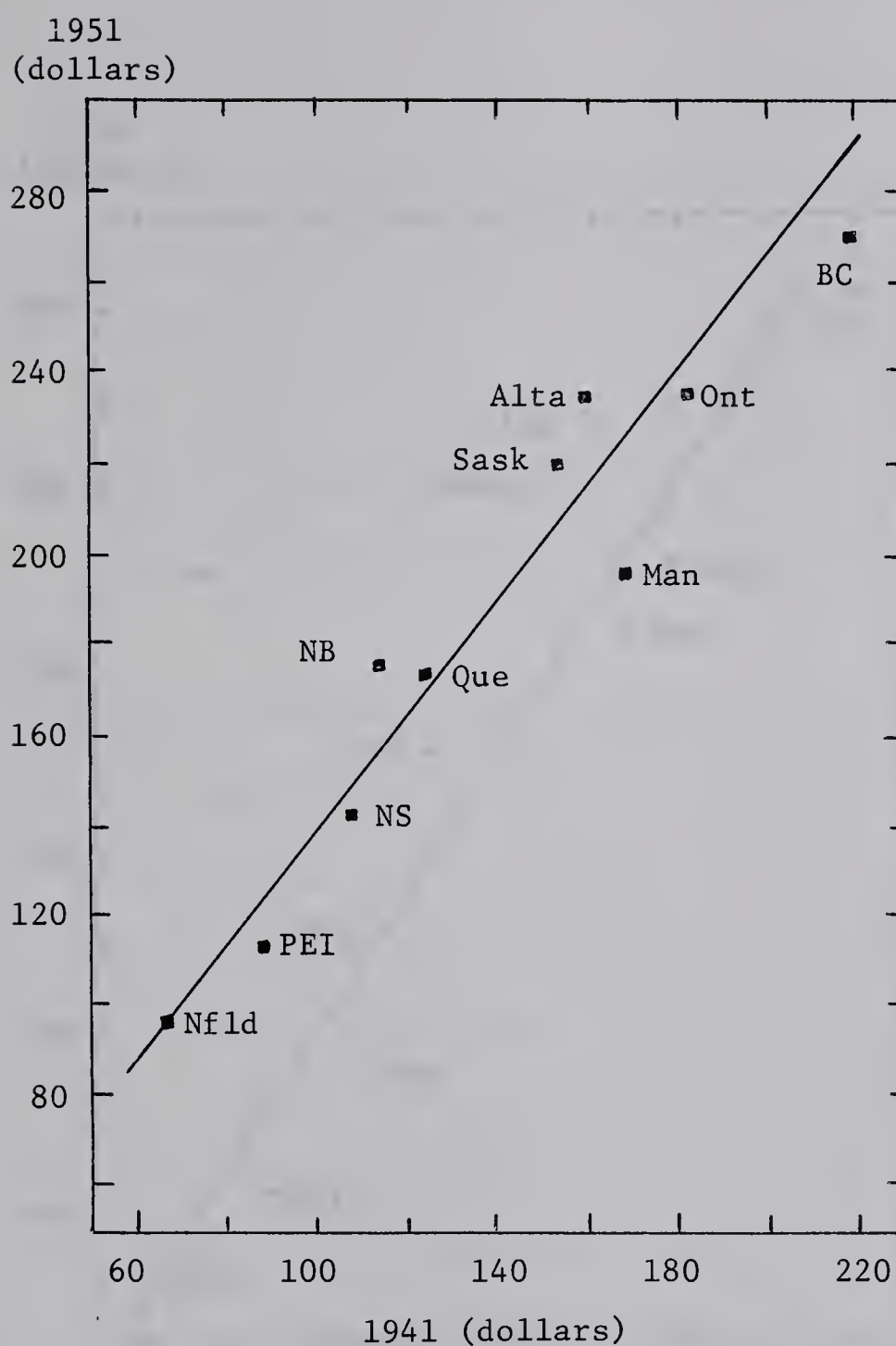


Figure 5. Regression of 1951 on 1941 Provincial Education Expenditures^a

^aCurrent expenditures per pupil in A.D.A. in elementary and secondary schools in constant 1957 dollars.

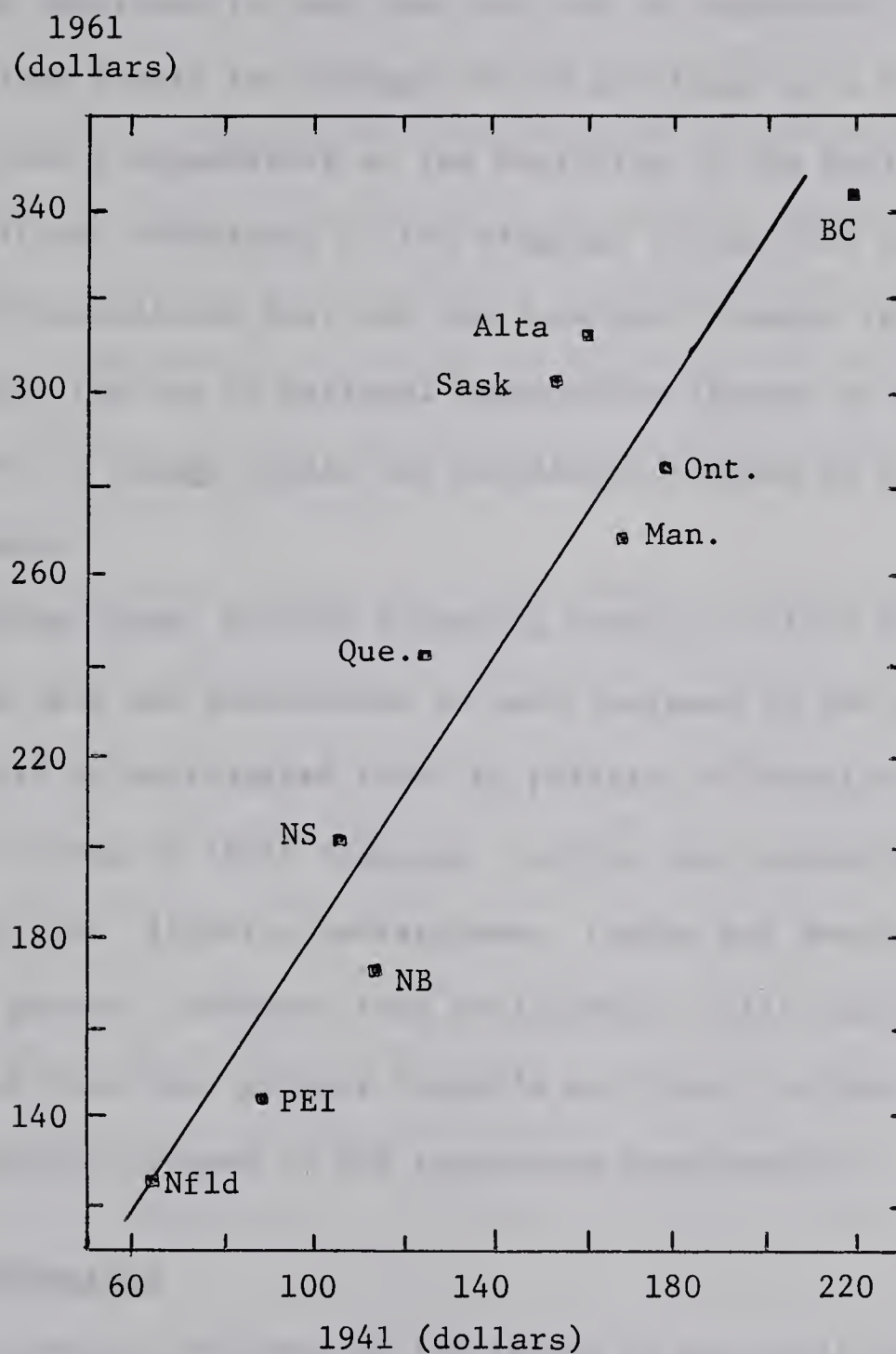


Figure 6. Regression of 1961 on 1941 Provincial Education Expenditures^a

^aCurrent expenditures per pupil in A.D.A. in elementary and secondary schools in constant 1957 dollars.

lines would weaken the description of all provinces without improving the position of Newfoundland.

It is important to note that the use of regression lines as sets of expectations treats the changes in the provinces as a linear function of the province's expenditure at the beginning of the period.⁴ There is a recognition, therefore, of the singular forces that establish the initial year expenditure size and the developed changes in later years. Alternatively, the use of national expenditure figures as sets of expectations for change treats the provincial changes on an undifferentiated basis.

In these terms, British Columbia, Ontario, Prince Edward Island, and Manitoba have not experienced as much increase in per pupil expenditures as would be anticipated from the pattern of behaviour of all provinces in terms of their singular, initial year expenditure sizes. On the other hand, Alberta, Saskatchewan, Quebec and Newfoundland have experienced greater increases than anticipated, while the changes in New Brunswick have been grossly variable and those for Nova Scotia have been tightly related to the regression expectancies.

Aspects of Disparity

The essential features of the levels of per pupil education expenditures can be reduced to three facts: (1) the per pupil expenditures of the provinces have appreciably risen, in gross amounts, from

⁴Frank A. Hanna, "Analysis of Interstate Income Differentials: Theory and Practice," National Bureau of Economic Research, *Regional Income*, Studies in Income and Wealth, Vol. XXI (Princeton: Princeton University Press, 1957), pp. 132 - 137.

1941 to 1961; (2) this rise in time has continued and altered a disparity in space, due to the fact that per pupil expenditures of the different provinces have been raised at very different rates. These disparities in space, or ranges of expenditure differences, have displayed a tendency to narrow over time, but the degree of disparity remains obviously large; (3) while the disparities in expenditures have narrowed very modestly, there is evidence of regression. The use of regression to describe the different behaviour of the provinces during the overall period, and the functional aspect of regression lines as sets of expectations, are worthy of note.

The appreciable rise in constant dollar current expenditures per pupil during the overall period is indicative, simply, of the fact that the cost of educating an elementary/secondary pupil in Canada has advanced sharply. Since categories of expenditures are impossible to establish statistically over time, it is not possible to ascertain a true picture of the changing structures of expenditures, particularly in terms of inter-provincial differences. Two broad factors, however, may be adduced as principal causes of expanding per pupil costs.

Secondary Enrolments. One factor has been the expanding proportion of secondary school enrolments over total enrolments.⁵ This fact is important in expenditure analysis since costs of high school education exceed costs at the elementary level. It is sufficient to note that the education of a secondary school pupil requires more specialized services, disposes of more supplies, and is often burdened

⁵Canadian Teachers' Federation, *Financing Education in Canada* (Ottawa, October, 1965), p. 21.

with extra charges for transportation. As shown in Table XVIII, the proportions of secondary school enrolments to total enrolments have expanded in all provinces with the exception of British Columbia.

Generally, the higher expenditure provinces, with the exception of Manitoba, have experienced lower proportional changes between 1941 and 1961 than the lower expenditure provinces, with the exception of Nova Scotia. Inspection of the data in Table XVIII reveals that the order of the provincial proportions of secondary enrolments in 1961 is virtually identical to the rankings of the provinces in terms of average per pupil expenditures.

Table XVIII also gives the percentage changes in both elementary and secondary school enrolments from 1941 to 1961. With the sole exception of British Columbia, there has been a very much greater proportional growth in secondary enrolments compared to the growth in elementary enrolments. Again, four of the five higher expenditure provinces (British Columbia, Ontario, Alberta, and Saskatchewan) exhibit lower proportional differentials between their elementary and secondary enrolment growth rates than do most of the lower expenditure provinces (Quebec, New Brunswick and Newfoundland).

Salary Levels. Associated with mounting secondary school enrolments has been the substantial increase in teacher salary levels; the second general cause of expanding per pupil costs. Salary costs form the dominant single expenditure category, accounting for around 70 per cent of all current education expenditures.

The constant 1957 dollar costs of teacher salaries per pupil in A.D.A. are set out in Table XIX. Visual inspection of the data reveals

TABLE XVIII

SECONDARY ENROLMENTS AS PER CENT OF TOTAL ENROLMENTS,
AND PERCENTAGE CHANGE IN PROVINCIAL ELEMENTARY^a
AND SECONDARY^b PUBLIC SCHOOL ENROLMENTS,
1941 AND 1961

Province (ranked by 1941-61 average education expenditure)	Secondary Enrol- ments as Per Cent of Total Enrolments		Elementary Enrolments Per Cent Change	Secondary Enrolments Per Cent Change
	1941	1961	1941-61	1941-61
British Columbia	24.0	23.1	172.0	157.7
Ontario	18.0	20.1	110.4	140.3
Alberta	19.7	22.1	74.8	101.8
Saskatchewan	17.6	20.7	- 0.3	21.7
Manitoba	16.7	20.4	37.6	75.6

Quebec ^c	14.0	18.1	75.7	138.9
New Brunswick	11.3	16.8	55.0	146.7
Nova Scotia	14.3	16.2	50.0	73.8
Prince Edward Island	14.9	17.6	30.5	59.3
Newfoundland	8.6	14.9	78.5	233.1

^aElementary includes grades I to VIII inclusive; see footnote c.

^bSecondary includes all grades above grade VIII, see footnote c.

^cQuebec 1941 figures are estimated; enrolments in grade VIII are included in Secondary rather than Elementary since this grade is considered Secondary in Quebec.

Source: Enrolment data calculated from: D.B.S., *Survey of Elementary and Secondary Education, 1960 - 61* (Ottawa: Queen's Printer, 1963), Tables 2-13 and 2-42.

TABLE XIX

PROVINCIAL TEACHER SALARIES PER PUPIL IN A.D.A. IN CONSTANT
1957 DOLLARS^a, AND PERCENTAGE RATES OF INCREASE
1941, 1951, 1961

Province (ranked by 1941-61 average education expenditure)	Salaries per pupil			Percentage Increase	
	1941	1951	1961	1941-51	1941-61
British Columbia	140.9	167.2	220.8	18.6	56.7
Ontario	119.4	152.8	190.5	27.9	59.5
Alberta	100.3	149.4	209.4	48.9	108.7
Saskatchewan	90.8	137.0	195.2	50.8	114.9
Manitoba	103.5	127.9	181.3	23.5	75.1

Canada	86.7	115.1	157.2	32.7	81.3

Quebec	58.0	78.7	133.3	35.6	129.8
New Brunswick	76.5	115.7	121.9	51.2	59.3
Nova Scotia	70.7	88.8	128.3	25.6	81.4
Prince Edward Island	62.3	75.0	103.5	20.3	66.1
Newfoundland	44.4	58.2	87.8	31.0	97.7

^aCurrent dollar data adjusted for differences in prices over time. Refer to Footnote b, Table XLIII, Appendix B.

Source: Teacher salary data from: D.B.S., *Survey of Education Finance, 1961* (Ottawa: Queen's Printer, 1964), Table 9; and D.B.S., *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1959), Table 59.

a strong accord between the rankings of provinces in terms of per pupil current education expenditures and teacher salaries per pupil. The rapid increases in per pupil teacher costs between 1941 and 1961 are readily apparent. While the rates of growth vary widely, it is significant that those provinces displaying the higher growth rates are identical to the provinces positioned above the regression lines in Figures 5 and 6. Thus New Brunswick, Saskatchewan, Alberta, and Quebec (with Newfoundland) represent the fastest-growing expenditure provinces for both current expenditures per pupil and teacher salaries per pupil between 1941 and 1951, and 1941 and 1961, with the exception that Nova Scotia replaces New Brunswick in the latter period.

The firm advance in salary costs per pupil represents a notable rise in real salaries.⁶ A number of factors have occasioned this expansion; notably, the upgrading of qualifications, the extension of equal pay for the sexes, and the general prosperity of the market for skilled labour.

Other Factors. The extent to which other factors have contributed to the expansion of per pupil current expenditures is speculative. The additions of ancilliary school services, the expansion of supervisory personnel, and developments in the technology of education are all logically relevant, but statistically invisible, causal factors. In broad terms it can be concluded that the expansion of per pupil expenditures has been considerably affected by mounting secondary pupil enrolments and conspicuous additions in the costs of teacher services.

⁶Canadian Teachers' Federation, *Teacher Salaries: Trends and Comparisons* (Ottawa, September, 1964), Chapter II.

If these two factors are accepted as major causes of increasing per pupil costs of education, the phenomenon of an operative regression function for per pupil expenditures is an expectation beyond the possible singularity of the data. Presumably there are limits to the extension of secondary enrolments and to the expansion of salary levels. There are indications in Table XVIII, page 162, that the proportions of secondary enrolments to total enrolments are levelling out in the higher expenditure provinces. Similar indications occur for salary levels as the percentage changes between 1941 - 61 for British Columbia and Ontario, the two highest expenditure provinces, are notably less than those for all other provinces, with the single exception of New Brunswick (Table XIX, page 163).

Regionality. A feature which emerges from the previous discussion is the apparent difficulty of establishing consistent patterns of behaviour among groups of provinces. The singularity of individual rates of growth and widely fluctuating levels of data in individual provinces seemingly preclude attempts to discern regions marked by homogeneous patterns of development. This difficulty is accentuated since only three single years, covering two decades of development, are used as data sources.

The boundaries of the ten provinces in themselves define basic regions. It will, however, be useful to group the provinces as four major regions. These are: the Atlantic (the three maritime provinces and Newfoundland); Quebec; the three Prairie provinces; and Ontario/British Columbia. Each of these four regions is essentially homogeneous with respect to levels of per pupil expenditures; proportions of secondary

enrolments; levels of teacher salaries; and, in considerable degree, their relative rates of growth for each of these factors. With the exception of the combination of Ontario/British Columbia, the delineated regions concur with those defined by the Economic Council of Canada.⁷

Given this definition of regions in Canada, a number of factors which appear to contribute in various degrees to inter-provincial variations in per pupil education expenditures may be explored. The boundaries of the ten provinces remain the basic comparative units. The introduction of broader regions will provide a larger perspective, be informative in terms of homogeneous factors, and largely concur with the traditional concepts of economic regionality in Canada.

Summary

The statistical description of disparities in levels of pupil education expenditures shows that absolute expenditure differences have increased from 1941 to 1961, while absolute amounts of provincial expenditures have risen substantially throughout this period. Absolute data, however, conceal the relative efforts of individual provinces in terms of the national improvement in per pupil expenditures. In relative terms, there has been a modest narrowing of expenditure differentials. This narrowing of expenditure differentials provides evidence for the regression of per pupil expenditures towards the national mean. The behaviours of provincial salary costs per pupil, one of the major causes of expanding education expenditures, accords with the behaviours of provincial per pupil education expenditures.

⁷Economic Council of Canada, *Second Annual Review: Towards Sustained and Balanced Economic Growth* (Ottawa: Queen's Printer, 1965), p. 98.

In consequence, Alberta, Saskatchewan, Quebec, Newfoundland, with New Brunswick (1941-51) and Nova Scotia (1951-61) display above average growth rates in both expenditure categories. The behaviours of provincial proportions of secondary enrolments additionally support the concept of regression as the higher expenditure provinces tend to experience lower proportional changes between 1941 and 1961 than do the lower expenditure provinces. Finally, in terms of per pupil education expenditures, four largely homogeneous regions may be delineated: the Atlantic provinces, Quebec, the Prairie provinces, and Ontario/British Columbia.

PER PUPIL EXPENDITURES AND PERSONAL INCOME

In the previous chapter it was found that the personal income measure used in this study, X_9 , personal income per capita in constant 1957 dollars, explained between 86 and 93 per cent of the variance in X_1 (Education Expenditures). The personal income measure emerged as the clearly dominant determinant of per pupil education expenditures. Further, it was shown that the addition of independent variables beyond the personal income measure did not add greatly to the understanding of the variance in per pupil education expenditures. Since the personal income measure exerts such a dominant influence on levels of per pupil expenditures, it is appropriate to consider the relationship between these two measures in some detail.

Provincial Disparities

Raw Data Comparisons. The provincial levels of personal income per capita for $\overline{1941}$, $\overline{1951}$, and $\overline{1961}$, are set out in Table LI of

Appendix B.⁸ While the range of inter-provincial differences in absolute terms increases from \$823 in 1941 to \$882 in 1961, the relative range declines from 1.04 in 1941 to 0.67 in 1961. In comparison, the relative range of per pupil education expenditures declines from 1.08 to 0.82 during the same period. The inter-provincial relative income ranges are considerably smaller, then, than those for per pupil education expenditures.

In the relative terms provided by the coefficients of variation, further evidence of the pronounced narrowing of inter-provincial differences is provided: from 33.3 in 1941, through 29.8 in 1951, to 24.1 in 1961. Comparatively, the coefficients of variation for per pupil education expenditures narrow only slightly from 33.36 in 1941 to 31.36 in 1961.

A final feature of the raw data comparisons is the marked stability of the rank orders of provinces, both for personal income and education expenditures, throughout the three time periods. The coefficients of rank correlation between 1941 and the 1951 and 1961 provincial income data are .95 and .98, both significant at the 0.01 level. The rank order coefficients for per pupil education expenditures in the same periods are .95 and .89.

Comparison of Provincial Indexes. The behaviours of the provincial income indexes, shown in Table XX, reveal diversity of change but a marked narrowing of inter-provincial variation. In Figure 7, the charting of the income indexes and the per pupil education expenditure

⁸Three-year averages, centred on the year indicated by a bar.

TABLE XX
INDEXES OF PERSONAL INCOME PER CAPITA
BY PROVINCES, CANADA = 100
1941, 1951, 1961

Province ^a	1941	1951	1961
British Columbia	144.8	135.6	131.3
Ontario	152.6	133.7	133.4
Alberta	112.5	125.6	116.1
Saskatchewan	97.1	123.2	105.0
Manitoba	112.0	112.2	113.4

Canada	100.0	100.0	100.0

Quebec	103.2	94.2	99.2
New Brunswick	76.9	74.8	77.0
Nova Scotia	93.6	80.2	86.5
Prince Edward Island	59.1	64.0	71.7
Newfoundland	48.3	56.5	66.3

^aRanked by 1941-61 average education expenditure.

Source: Table LI, Appendix B.

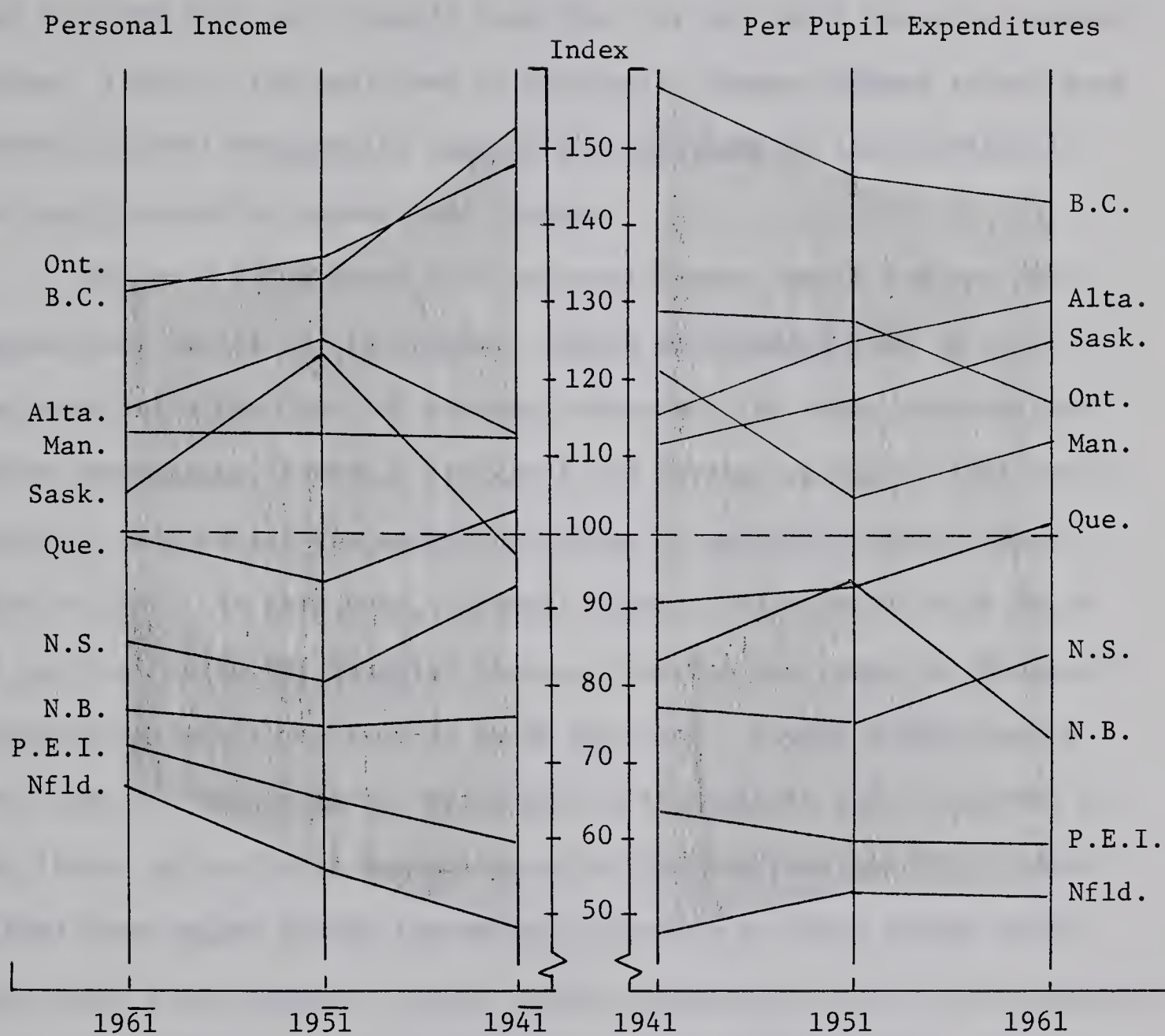


Figure 7. Indexes of Per Pupil Education Expenditures and Personal Income Per Capita, By Provinces, 1941, 1951, 1961 (Canada = 100)

indexes demonstrates three notable conclusions. First, the absolute range of provincial income variations is considerably smaller than that for per pupil education expenditures. Second, the disparity in income has narrowed much more rapidly than that for per pupil education expenditures. Finally, the positions of provincial income indexes reveal more marked regional homogeneity than do the positions of the provincial per pupil education expenditure indexes.

Figure 7 illustrates that personal income levels and per pupil expenditure levels in the Atlantic region have ranged from 48 to 93 per cent below the Canadian average throughout the three time periods. These percentages, however, represent the extreme spread in 1941 particularly, and conceal the marked narrowing of personal income dispersion by 1961. In that year, personal income levels ranged from 66 to 86 per cent below the Canadian average, whereas the range in education expenditure levels was from 52 to 84 per cent. Visual inspection of the lines for the Atlantic region provinces suggests that increases in the levels of per pupil expenditures for Newfoundland and Prince Edward Island have lagged behind the marked increases in their income levels. The Quebec lines suggest that per pupil expenditure levels have increased more rapidly than personal income during the overall period. In the Prairie region, there have been wide fluctuations in income levels, except for Manitoba, but relatively steady increases in expenditure levels. The indexes for British Columbia and Ontario are conspicuously alike for income levels and dissimilar for expenditure levels. Visual impression suggests that the Ontario per pupil expenditure levels are very much lower than its personal income levels.

Per Pupil Expenditures as Proportions of Personal Income. Further indication of the disparities among the provinces in education expenditures may be found by expressing provincial per pupil expenditures for public elementary and secondary education as percentages of provincial personal incomes per capita, both measures being in constant 1957 dollars. The details are provided in Table XXI. The ratios are illuminating. The national average has shown an overall rise from 17.6 per cent in 1941 to 18.3 per cent in 1961, noting the decline to 16.8 per cent in 1951. Comparatively, the provincial ratios have fluctuated widely, expanding the relative range of ratios from .301 in 1941 to .415 in 1961. The ratios of three of the five higher expenditure provinces have registered overall increases (British Columbia, Alberta, and Saskatchewan) remaining, largely, well in excess of the national average. Ontario is conspicuous for ratios that are lower than the national average in each year, while Manitoba is the only higher expenditure province displaying an overall decline in its ratios. While there has been a steady advance in the income ratios of Quebec and Nova Scotia, each of the remaining lower expenditure provinces has shown notable declines swinging them further away from the national average in 1961 than they were in 1941. It is noteworthy that Newfoundland and Prince Edward Island show the largest overall decline in income ratios of all the provinces.

Provincial Income Elasticities. An indication of the responsiveness of provincial per pupil education expenditures to a one per cent increase in provincial personal incomes may be derived from estimations of provincial income elasticities of education expenditures. The

TABLE XXI

PER PUPIL EDUCATION EXPENDITURES AS PERCENTAGES
OF PERSONAL INCOME PER CAPITA BY PROVINCES
1941, 1951, 1961

Province ^a	1941	1951	1961
British Columbia	19.2	18.2	20.0
Ontario	15.0	16.2	16.3
Alberta	18.0	16.9	20.5
Saskatchewan	20.1	16.1	22.0
Manitoba	19.0	15.9	18.0

Canada	17.6	16.8	18.3

Quebec	15.4	16.4	18.6
New Brunswick	18.9	21.1	17.2
Nova Scotia	14.8	16.0	17.9
Prince Edward Island	19.1	15.8	15.2
Newfoundland	17.2	15.6	14.4

^aRanked by 1941 - 61 average education expenditure.

Source: Tables XLIII and LI, Appendix B.

elasticities are estimated on the basis of a single regression of individual provincial per pupil education expenditures and personal incomes per capita from 1941 to 1961. The provincial elasticities are reported in Table XXII.

Table XXII shows that the national income elasticity of 1.091 is exceeded, or closely met, by all the provinces except New Brunswick, Prince Edward Island, and Newfoundland. Nova Scotia (1.455), Quebec (1.411), and Ontario (1.217) rank highest in income elasticities but their 1941 relative starting points were considerably lower than for any of the other provinces (Table XXI). Alberta (1.165) and British Columbia manifest above average income elasticities on relatively high 1941 bases. For each of these five provinces, the implication is that for every one per cent rise in personal income per capita its per pupil education expenditure for public elementary and secondary schools has expanded by more than one per cent. Among the remaining provinces Saskatchewan (.946) and Manitoba (.922) approach the national average, while Newfoundland (.794), New Brunswick (.786), and Prince Edward Island (.707) are well below the national figure.

There is, of course, an identical relationship between the levels of income elasticities and the decennial changes in the proportions of personal income devoted to education expenditures (Table XXI). For example, Prince Edward Island exhibits the lowest income elasticity (.707) and the greatest persistent decline in its proportion of personal income devoted to per pupil education expenditures. On the other hand, Nova Scotia and Quebec have the highest income elasticities (1.4) and the most persistent decennial gains in their income/expenditure ratios.

TABLE XXII

INCOME ELASTICITIES OF PER PUPIL EDUCATION
EXPENDITURES FOR PUBLIC ELEMENTARY
AND SECONDARY SCHOOLS
BY PROVINCES
1941-61

Province ^a	1941-61
British Columbia	1.093
Ontario	1.217
Alberta	1.165
Saskatchewan	.946
Manitoba	.922

Canada	1.091

Quebec	1.411
New Brunswick	.786
Nova Scotia	1.455
Prince Edward Island	.707
Newfoundland	.794

^aRanked by 1941-61 average education expenditure.

Source: Tables XLIII and LI, Appendix B.

A conspicuous feature is the lower elasticities of the Atlantic region provinces, excepting only Nova Scotia. The implication is that the priority of educational spending for public elementary and secondary schools in terms of current expenditures in the Atlantic region has been considerably lower than in other regions of Canada.

Regression. A final indicator of disparities among the provinces in levels of education expenditures in relation to personal income levels is given by the prediction of per pupil education expenditures from the simple regression of these two measures. The details are reported in Table XXIII. These figures provide a further illuminating dimension of provincial disparities. Particular interest attaches to those provinces that have spent considerably more and those that have spent considerably less than the predicted per pupil expenditures. It will be noted that the predictions are based on the regression equations which accrue from the individual provincial income and expenditure levels assessed as a whole. Hence the predictions are determined by the statistical national averages, figures which do not represent actual performances.

British Columbia, Alberta, and New Brunswick are the only provinces that emerge with persistently higher than predicted expenditures. Saskatchewan spent considerably more than predicted in 1941 and 1961, but less in 1951. The lower expenditure levels in 1951 can be explained in terms of the unprecedented rise in Saskatchewan's personal income levels in 1951 (see Figure 7), which was attributable in large part to the great expansion in wheat exports at that time.⁹ Manitoba

⁹Royal Commission on Canada's Economic Prospects, *Final Report* (Ottawa: Queen's Printer, 1963), Table 8-1, p. 155.

TABLE XXIII

PREDICTED^a PER PUPIL EDUCATION EXPENDITURES AND DIFFERENCES
BETWEEN ACTUAL AND PREDICTED VALUES, BY PROVINCES
1941, 1951, 1961

Province (ranked by 1941-61 average education expenditure)	Predicted Expenditures (constant 1957 dollars)			Differences Between Actual and Predicted Values (constant 1957 dollars)		
	1941 ^b	1951 ^c	1961 ^d	1941	1951	1961
British Columbia	196.2	250.0	331.9	-23.8	-20.9	-12.5
Ontario	206.2	246.4	338.2	26.7	9.4	52.6
Alberta	154.7	231.5	287.6	- 5.6	- 1.2	-25.0
Saskatchewan	134.9	227.2	255.0	-19.5	9.4	-48.6
Manitoba	154.1	206.8	279.6	-14.0	11.6	11.6

Canada	138.6	184.4	240.4	---	---	---

Quebec	142.8	173.7	238.0	17.2	4.2	- 4.4
New Brunswick	108.8	138.1	173.2	- 6.1	-34.7	- 1.0
Nova Scotia	130.4	147.9	200.9	21.3	7.7	- 2.9
Prince Edward Island	86.1	118.1	157.6	- 2.9	7.5	14.1
Newfoundland	72.2	104.3	141.6	6.5	7.5	16.1

^aSee following footnotes for regression equations and standard errors obtained from stepwise multiple regression analyses of the dependent variable X_1 (Education Expenditures) and one independent variable X_9 (Personal Income) from the previous chapter.

^b1941 equation: $a = 10.04$; $b = .1628$; S.E. = 2.34.

^c1951 equation: $a = 0.31$; $b = .1681$; S.E. = 1.67.

^d1961 equation: $a = -52.17$; $b = .2228$; S.E. = 3.01.

spent more than predicted in 1941 but less thereafter. A very different picture emerges for Ontario. This province persistently spent less on education than predicted, a performance equalled only by Newfoundland. The differential in Newfoundland, however, is proportionally less than for Ontario. Quebec and Nova Scotia spent less in 1941 and 1951, but more than predicted in 1961. The persistent rise in expenditure levels in these provinces reflects their 1.4 income elasticity ratios. The remaining province, Prince Edward Island, spent somewhat more than predicted in 1941 and less thereafter.

Summary

The previous analyses have provided a number of indicators of provincial disparities in levels of per pupil education expenditures. The highlights of these analyses, together with indications of trends, are collected in Table XXIV. In this table, six indicators of provincial disparities in education expenditures are presented in terms of rank. The six indicators are: indexes of per pupil education expenditures (Table XVII), rates of growth for these indexes (Figures 7 and 8), ratios of per pupil education expenditures to personal income (Table XXI), rates of growth for these ratios (Table XXI), income elasticities (Table XXII), and prediction of per pupil expenditure levels from personal income levels (Table XXIII). Each of these indicators is ranked in terms of its average 1941-61 levels and changes, by provinces. The simplicity of the table quite obviously masks details which are given in full in the respective textual tables.

The patterning of each of the indicators emerges clearly from Table XXIV. British Columbia and Manitoba, both relatively high

TABLE XXIV

RANK ORDERS OF INDICATORS OF DISPARITIES IN PROVINCIAL
LEVELS OF PER PUPIL EDUCATION EXPENDITURES
PROVINCIAL RANKINGS
1941-61

Province ^a	Col.1 ^b	Col.2 ^c	Col.3 ^d	Col.4 ^e	Col.5 ^f	Col.6 ^g
British Columbia	1	7	2	6	5	3
Ontario	2	8	9	5	3	10
Alberta	3	1	4	3	4	4
Saskatchewan	4	2	1	4	6	2
Manitoba	5	10	5	7	7	5

Quebec	6	4	6	1	2	7
New Brunswick	7	6	3	8	9	1
Nova Scotia	8	5	8	2	1	8
Prince Edward Island	9	9	7	10	10	6
Newfoundland	10	3	10	9	8	9

^aRanked by 1941-61 average education expenditures.

^bIndexes of per pupil education expenditures, 1941-61 average, from: Table XVII, p. 153.

^cAverage 1941-61 rates of growth for indexes of per pupil education expenditures. From: Figures 5 and 6, pp. 157, 158.

^dRatios of per pupil education expenditures to personal income average 1941-61. From: Table XXI, p. 173.

^eAverage 1941-61 rates of growth for ratios of per pupil education expenditures to personal income. From: Table XXI, p. 173.

^fIncome elasticities. From: Table XXII, p. 175.

^gPrediction of per pupil education expenditures from personal income levels, average 1941-61 difference between actual and predicted expenditures. From: Table XXIII, p. 177.

expenditure provinces (column 1), are marked by higher proportions of personal income being spent on education (column 3), close to average income elasticities (column 5), and higher than predicted per pupil expenditures in terms of expectancies derived from income predictions (column 6). Their rates of growth, though, as indicated by the regression function for education expenditures (column 2) and changes in the proportions of personal income spent on education (column 4) are less than the average for the nation. With these trends, British Columbia nevertheless remains well in advance of all other provinces in levels of per pupil education expenditures.

The Ontario pattern is similar, except that it is further distinguished by lower proportions of personal income being spent for education (column 3) and, concomitantly, very much lower than predicted expenditures in terms of predictions based on income levels (column 6). In terms of these several indicators, Ontario's "effort"¹⁰ in education spending is very much less than its own income levels and the national patterns would indicate. The generally declining per pupil expenditure indexes of these three provinces have been largely responsible for the modest narrowing of expenditure disparities throughout the provinces of Canada.

Alberta and Saskatchewan, both higher expenditure provinces, are distinguished by higher than predicted per pupil expenditures both in terms of their 1941 expenditure bases (column 2) and their personal income levels (column 6). Both provinces exhibit high, and rising, proportions of personal income utilized for education expenditures (columns 3 and 4) and near to average income elasticities (column 5).

¹⁰The concept of "effort" is discussed in the following section.

The "effort" of these two provinces in education spending is very much greater than their own income levels, and the national pattern, would have anticipated.

Of the five lower expenditure provinces, only Quebec and Nova Scotia have shown a persistent pattern of growth in per pupil education expenditures. In common with the broad pattern of all the lower expenditure provinces, Quebec and Nova Scotia rank lower than average on levels of per pupil education expenditures (column 1), proportions of income devoted to education spending (column 3), and lower than predicted expenditures in terms of their personal income levels (column 6). Significantly, these two provinces rank high on each of the indicators of growth (columns 2, 4, and 5). In terms of their initial expenditure levels, the "effort" of these two provinces is even more pronounced than that of Alberta and Saskatchewan.

Alone among the provinces, New Brunswick exhibits an unusual pattern. Its pattern is similar to that of British Columbia and Manitoba, with the important exception that it is a lower expenditure province. It differs, too, in having a lower income elasticity. The lower income elasticity, together with declining trends in other indicators, should not disguise the fact that New Brunswick's expenditure levels and proportions of personal income devoted to education have been, overall, considerably higher than its income levels and the national averages would indicate. The notable drop in this province's "effort" particularly from 1951-61 remains, however, conspicuous.

Newfoundland and Prince Edward Island display similar characteristics except that Newfoundland has had higher rates of growth (column 2)

for education expenditures, advancing its expenditure levels somewhat nearer the national average. With this exception, the provinces are marked by the nation's lowest expenditure levels, the nation's lowest proportion of personal income devoted to education expenditures (for Newfoundland--column 3) and lowest income elasticity (for Prince Edward Island--column 5), and less spending than their respective income levels would anticipate (column 6). Furthermore, the direction of each of these indicators is towards further decline. In these terms, the "effort" of these provinces has been relatively lower, compared to both the national pattern and their sister Atlantic provinces.

Aspects of Disparity

The Concept of Effort. The use of the term "effort" in the previous section requires additional comment. It was argued in Chapter II that Effort was basically a Political function. In consequence, Effort was equated with Political factors as a major category of determinants of education expenditures. Furthermore, it was pointed out that indicators of Effort derive from the relationship between actual education expenditures and measures of Ability. Effort is, in its simplest terms, that proportion of wealth devoted to education expenditures. It is not an intention of this study to produce an unassailable indicator of Effort. The use of the term Effort in this study is defensible only in terms of the scope and nature of the findings presented.

Effort in Terms of Personal Income per Capita. As stated previously, the simplest indicator of Effort is that proportion of wealth

spent on education. Personal income is one measure of wealth. The findings of this study show that personal income per capita is by far the strongest determinant of levels of per pupil education expenditures. In the multiple regression analyses of Chapter IV, the levels of personal income per capita explained between 86 and 93 per cent of the variance in per pupil education expenditures, decennially 1941 to 1961. The multiple regression analyses provided prediction equations that accrued from the relationship between the personal income and education expenditure variables for the ten provinces assessed as a whole. Hence the prediction equations were able to provide predictions of provincial education expenditures based upon the extremely close national relationships between levels of personal income and education expenditures (see Table XXIII, page 177). In these terms it was suggested that those provinces spending more, or less, for public elementary and secondary school current expenditures than their levels of personal income per capita would anticipate were displaying greater, or less, Effort.

The three prediction equations were derived from the experiences of individual provinces assessed as a whole in each of the three time periods. Perfect prediction nationally obviously does not imply perfect prediction at provincial levels. This is an important point, for it suggests that the provincial ratios of education expenditures to personal income are not necessarily to be equated with the levels of the national ratios. Hence, in terms of the overall patterns of performance, the proportions of personal income devoted to education expenditures may be expected to be less in some provinces and more in others.

This statement echoes the argument that it is not realistic to expect each province to devote a similar proportion of its personal income to education expenditures.¹¹ Since there are wide disparities in levels of personal income per capita and numbers of pupils relative to total population, it follows that there will be disparities in the proportions of personal income spent on education. For example, a high income province with low proportions of pupils to total population can more easily afford to expand its education expenditure/personal income ratio than can a province with depressed income levels and high proportions of pupils. Furthermore, should a province in the latter category expand its ratio near to, or beyond, that of a province in the former category, then this province is clearly demonstrating a good deal more Effort.

Table XXV provides the decennial proportions of pupils in A.D.A. to total populations and the predicted education expenditures per pupil as proportions of personal income per capita, for each of the provinces ranked by their average 1941-61 personal income per capita levels. A notable feature of the data is that, as the proportions of pupils in A.D.A. expand, the predicted proportions of personal income spent on education move to parallel the relative provincial levels of income. Broadly, it would appear that the lower income provinces could afford higher expenditure/income ratios in 1941 as their proportions of pupils in A.D.A. were generally less than those of the higher income provinces.

¹¹ Canadian Teachers' Federation, *Financing Education in Canada* (Ottawa: Canadian Teachers' Federation, 1965), pp. 86 - 95.

TABLE XXV

PUPILS IN A.D.A. AS PER CENT OF TOTAL POPULATION, AND
 PREDICTED EDUCATION EXPENDITURES PER PUPIL AS
 PER CENT OF PERSONAL INCOME PER CAPITA
 BY PROVINCES
 1941, 1951, 1961

Province (ranked by 1941-61 average personal income per capita	Pupils in A.D.A. as per cent of total population ^a			Predicted Education Ex- penditures as per cent of personal income ^b		
	1941	1951	1961	1941	1951	1961
Ontario	15.3	15.1	21.5	17.1	16.8	19.3
British Columbia	12.5	13.6	18.7	17.1	16.8	19.3
Alberta	17.3	16.7	21.6	17.4	16.8	18.9
Manitoba	14.9	14.8	19.6	17.4	16.8	18.8
Saskatchewan	17.2	16.7	21.2	17.6	16.8	18.5

Quebec	14.5	13.9	19.9	17.5	16.8	18.3
Nova Scotia	15.5	18.0	22.8	17.6	16.9	17.7
New Brunswick	15.5	16.7	23.3	17.9	16.9	17.1
Prince Edward Island	13.6	15.6	21.3	18.4	16.9	16.7
Newfoundland	14.6	19.3	25.9	18.9	16.9	16.3

Canada	15.1	16.0	21.6	17.6	16.8	18.3

^aAttendance data: D.B.S., *Survey of Elementary and Secondary Education, 1961-62* (Ottawa: Queen's Printer, 1964), Table 2-14. Data for Quebec adjusted to exclude independent school pupils.

^bPredicted expenditures from: Table XXIII, p. 177.

In 1951 all provinces spent proportionally less on education than in 1941. It is notable that the lower income provinces experienced expanded proportions of pupils in A.D.A. relative to 1941 levels, while the expenditure/income ratios of the higher income provinces seemingly declined as their proportions of pupils in A.D.A. dropped. The 1961 pattern is largely counter to that of 1941. By this time, the predicted expenditure/income ratios are directly comparable with provincial income levels, noting that the expansion of pupils in A.D.A. proportions was highest in the lower expenditure provinces.

These broad relationships between levels of personal income per capita, proportions of pupils in A.D.A. to total population, and predicted proportions of education expenditures to personal income are illustrative of the adjustments inherent in the ratio, per pupil education expenditures as a percentage of personal income per capita. More importantly, the discussion has shown that these predicted ratios vary among the provinces.

Effort in Terms of Personal Income per Potential Work Force Member. It was pointed out in Chapter III, as a weakness of the per capita measure, that it assumes homogeneity in the age compositions of provincial populations. This homogeneity does not exist, as the data of Tables XLIV and LII in Appendix B illustrate. Table XLIV shows the disparities in proportions of total populations within statutory school-age limits, and Table LII gives the differentials in provincial numbers of dependents per 100 actual work force members. The data of these tables produce declining coefficients of variation for school-age

population proportions, from 16.01 in 1941 to 12.31 in 1961; and singularly expanding coefficients of variation for dependency proportions, from 12.61 in 1941 to 20.93 in 1961.

Since the population age compositions do vary importantly, it is useful to apply the previous analyses to personal income per potential work force member¹² rather than personal income per capita. The potential work force measure distributes total personal income only among those persons of working-age. In this manner, variations in crude provincial dependency sizes are eliminated and variations in working-age populations are taken into account.

Table XXVI records actual education expenditures per pupil as proportions of personal income per potential work force member, together with the predicted proportions, for the provinces ranked by their 1941-61 average personal income per potential work force member. The most striking feature of Table XXVI is the manner in which the predicted proportions of education expenditures to personal income per potential work force member directly concur with provincial levels of this income measure. In terms of different sizes of working-age populations and the national relationships between income levels and education expenditure levels, it may be taken as an expectation that the provinces were to spend very different proportions of their personal incomes per potential work force member on per pupil education expenditures. Predicted proportions for the higher income provinces were more than the national average proportion, while the predicted proportions for the lower income provinces were less.

¹²Defined as all persons between the ages of 15 and 65 inclusive.

TABLE XXVI

PREDICTED^b AND ACTUAL PER PUPIL EDUCATION EXPENDITURES
AS PERCENTAGES OF PERSONAL INCOME PER POTENTIAL
WORK FORCE MEMBER, BY PROVINCES
1941, 1951, 1961

Province (ranked by 1941-61 average personal income per potential work force member)	Predicted Per Pupil Education Expendi- ture Proportions ^a			Actual Education Expenditure Proportions ^a		
	1941 ^c	1951 ^d	1961 ^e	1941	1951	1961
British Columbia	11.5	10.6	11.4	13.1	11.4	11.7
Ontario	11.5	10.5	11.4	10.0	10.3	9.7
Alberta	11.4	10.5	11.1	12.1	10.5	11.8
Manitoba	11.3	10.3	10.9	12.9	9.9	10.5
Saskatchewan	11.2	10.5	10.7	13.4	9.8	12.5

Canada	11.3	10.2	10.4	11.3	10.2	10.4

Quebec	11.3	10.1	10.3	9.7	9.9	10.9
Nova Scotia	11.0	9.8	9.7	9.2	9.4	10.2
New Brunswick	11.1	9.7	9.3	11.5	11.9	9.3
Prince Edward Island	10.8	9.4	8.9	11.8	9.0	8.2
Newfoundland	10.7	9.1	8.7	8.5	8.5	7.5

^aas proportions of personal income per potential work force member.

^bSee following footnotes for regression equations and standard errors from stepwise multiple regression analyses, one variable--personal income per potential work force member in constant 1957 dollars--and the dependent variable--per pupil education expenditures in constant 1957 dollars.

^c1941 equation: $a = -10.05$; $b = .1212$; S.E. = 2.23.

^d1951 equation: $a = -31.37$; $b = .1192$; S.E. = 1.07.

^e1961 equation: $a = -106.4$; $b = .1507$; S.E. = 1.93.

Source: Tables XLIII and LXIII in Appendix B.

If these predictions are accepted as one dimension of Effort, three conclusions may be noted. First, the lower predicted ratios for the lower income provinces may be considered equivalent in Effort terms to the higher ratios for the remaining provinces. For example, Newfoundland's predicted ratio of 8.7 per cent in 1961 may be represented as a similar education expenditure Effort to British Columbia's ratio of 11.4 per cent in the same year. Secondly, there is provided one means of evaluating the relative Efforts of the different provinces by comparing their actual expenditure/income ratios to their predicted ratios. For example, Nova Scotia's 10.2 per cent actual ratio in 1961 indicates a higher Effort relative to its predicted ratio of 9.7 per cent. Alternatively, Manitoba's 1961 actual ratio of 10.5 per cent relative to its predicted ratio of 10.9 per cent suggests that Manitoba's Effort is less in that year. Finally, it is important to note that the relative provincial Effort performances provided by the data of Table XXVI concur directly with the findings of the previous sections in which personal income per capita was used as the income measure.

Some Research Comparisons. The findings of this study regarding inter-provincial disparities in per pupil current education expenditures for public elementary and secondary schools are dissimilar in important respects from earlier research work in this area. For comparative purposes, provincial data have been collected in Table XXVII, for 1951 and 1961, of indicators of Effort selected from earlier studies, together with comparable indicators from this study. Table XXVIII provides

TABLE XXVII

COMPARATIVE EFFORT DATA FOR PROVINCIAL ELEMENTARY AND
SECONDARY EDUCATION EXPENDITURES, SELECTED STUDIES
1951, 1961

Province ^a	1951				1961			
	1 ^b	2 ^c	3 ^d	4 ^e	5 ^b	6 ^c	7 ^d	8 ^e
British Columbia	2.7	2.5	19.4	18.2	4.2	3.7	21.7	20.0
Ontario	2.2	2.4	13.4	16.2	3.9	3.5	18.7	16.3
Alberta	2.6	2.8	13.8	16.9	5.4	4.4	26.2	20.5
Saskatchewan	2.4	2.7	11.4	16.1	6.3	4.7	29.7	22.0
Manitoba	2.1	2.3	13.0	15.9	4.0	3.5	21.1	18.0

Quebec	1.8	2.3	10.7	16.4	4.0	2.3	18.8	18.6
New Brunswick	3.6	3.5	17.7	21.1	4.6	4.0	18.6	17.2
Nova Scotia	2.6	2.9	12.2	16.0	4.2	3.3	18.7	17.9
Prince Edward Island	2.2	2.5	11.1	15.8	4.1	3.3	16.4	15.2
Newfoundland	2.2	3.0	12.1	15.6	4.5	3.7	14.9	14.4

^aRanked by 1941-61 average education expenditures.

^bTotal school board expenditures as per cent of personal income in current collars. From: Canadian School Trustees' Association, *A Brief to the Royal Commission on Taxation* (Woodstock: Canadian School Trustees' Association, 1963), Table D-18, p. 75; Canadian Teachers' Federation, *Educational Finance in Canada, 1946-56* (Ottawa, 1958), Table 20, p. 33 for 1951 data; Canadian Teachers' Federation, *Educational Inequalities: Brief to Mr. Lester Pearson, Prime Minister of Canada* (Ottawa: 1963), Table 5, p. 10 for 1961 data; Government of Prince Edward Island, *Report of the Commission on Educational Finance* (Charlottetown, 1960), Table 25, p. 51.

^cTotal current education expenditures for public elementary and secondary schools in constant 1957 dollars as per cent of total personal income, three-year averages, in constant 1957 dollars. From: data of this study.

^dSchool board expenditures per pupil enrolled as per cent of personal income per capita, current dollars. From: Canadian Teachers' Federation, *Financing Education in Canada* (Ottawa: 1965), Figure 41, p. 91.

^eCurrent expenditures for public elementary and secondary education per pupil in A.D.A. as per cent of personal income per capita, in constant 1957 dollars. From: data of this study.

TABLE XXVIII

COMPARATIVE RANKS FOR PROVINCIAL ELEMENTARY AND
SECONDARY EDUCATION EXPENDITURE INDICATORS,
SELECTED STUDIES
1951, 1961

Province ^a	1951				1961			
	1 ^b	2 ^c	3 ^d	4 ^e	5 ^b	6 ^c	7 ^d	8 ^e
British Columbia	2	7	1	4	5.5	5	2	3
Ontario	7	8	4	4	10	8	6	8
Alberta	3.5	4	3	3	2	2	1	2
Saskatchewan	5	5	6	1	1	1	3	1
Manitoba	9	9	5	8	7.5	7	5	5
Quebec	10	10	10	4	7.5	10	4	4
New Brunswick	1	1	2	1	3	4	9	7
Nova Scotia	3.5	3	6	7	5.5	3	8	6
Prince Edward Island	7	6	9	9	7	9	7	9
Newfoundland	7	2	7	10	4	6	10	10

^aRanked by 1941-61 average education expenditures.

^bSee footnote b, Table XXVII, p. 190.

^cSee footnote c, Table XXVII.

^dSee footnote d, Table XXVII.

^eSee footnote e, Table XXVII.

provincial rankings for the data of Table XXVII. The use of indicators of Effort permits comparisons to be made relatively synoptically.

The commonest indicator of Effort has been total education expenditures expressed as a percentage of total personal income. This ratio has not been employed in this study as it makes no allowances for the wide disparities in levels of income and pupil populations among the provinces of Canada (*supra.*). It is useful, however, to compare the more rigorously defined data of this study with those of earlier studies in terms of this ratio.

In Table XXVII, columns 1 and 5 provide these ratios from designated earlier studies, and columns 2 and 6 present the ratios derived from data used in this study. The notable differences in the ratio sizes between the earlier studies and those of this study are attributable to dissimilarities in the construction of the ratios. The earlier studies contain elements of capital and debt service expenditures and exclude direct provincial government expenditures (that is, total provincial government expenditures less grants to school boards). In contrast, the ratios developed in this study specifically exclude all capital and debt service expenditures and include direct provincial government expenditures. Furthermore, the earlier ratios are developed upon current dollar figures whereas the ratios in this study are based upon singular constant 1957 dollar data for personal income on the one hand, and education expenditures on the other.¹³

¹³The 1951 and 1961 price indices (1957 = 100) for personal income are 89.20 and 106.10 respectively, and for education expenditures, 76.53 and 110.60 respectively.

The most conspicuous differences between the data of this study and that of earlier studies are found between columns 1 and 2, and columns 5 and 6 of Table XVIII, which lists provincial ranks for the data of Table XVII. British Columbia's rank of 7 (column 2) in this study is considerably less than its rank of 2 (column 1) in earlier studies, for 1951 data. Alternatively, Newfoundland ranks low (7) in the earlier studies but high (2) in this study in the same year. In 1961, the pairs of ranks are more homogeneous, although the lower expenditure provinces, with the exception of New Brunswick, together with Ontario have sufficiently different ranks to be worthy of note. Since the ratio, total education expenditures to total personal income, has not been employed in this study, its use in this section is largely to illustrate the different results obtained with the more rigorous measure of education expenditures developed in this study as compared with the previous studies.

As stated previously, the ratio per pupil education expenditures as a percentage of personal income per capita embodies some adjustments for differences in levels of income and sizes of pupil population. This ratio has been used recently by the Canadian Teacher' Federation as an indicator of Effort.¹⁴ Columns 3 and 7 in Table XXVII, page 190, provide the Federation data, while columns 4 and 8 give similar data from this study. Again, the differences between the two sets of data are attributable to the use of constant dollar data and total current education expenditures in this study as opposed to current dollar data

¹⁴ Canadian Teachers' Federation, *Financing Education in Canada* (Ottawa, 1965), p. 86ff.

and school board expenditures, including elements of capital and debt service spending, in the Federation data. Further, the Federation ratios are developed upon a per pupil enrolled basis in contrast to the per pupil in A.D.A. basis of this study.

The notable differences between the two sets of data are evident in Table XXVIII in which columns 3 and 7, and 4 and 8 provide the respective provincial ranks. In 1951 British Columbia, Saskatchewan, Manitoba, Quebec, and Newfoundland are differentially ranked. In 1961 Ontario, Saskatchewan, New Brunswick, Nova Scotia, and Prince Edward Island show disparate ranks. The fundamental causes of these differences are the deflations of the Federation ratios by use of enrolment data, and of the ratios of this study by the elimination of capital and debt service expenditures.

It is unnecessary to introduce a polemic regarding the usefulness of particular indicators of Effort. Each measure has certain merits. It is, however, important to stress that the ratios used in earlier studies are insufficient to justify judgmental conclusions of comparative Effort in education spending. The findings of this study reveal that, in terms of the singular measures used, Newfoundland, Prince Edward Island, Nova Scotia (in 1951) and New Brunswick (in 1961) display considerably lower Effort performances than earlier studies would indicate. Alternatively, Quebec, Saskatchewan, and Manitoba to some extent, produce notably higher Effort performances in this study. It is significant that the remaining provinces hold largely similar positions in each of the studies.

Income Components. It was suggested in Chapter III that an examination of inter-provincial differences in the flows of personal income components would provide one means of exposing differences in the structures of provincial economies. Table XXIX provides the percentage income components of personal income for 1941, 1951, and 1961. Each of the provincial components (income from labour, farm, non-farm, property, and transfer payments¹⁵) has been expressed as a percentage of the provincial total personal incomes for the respective periods.

The data of Table XXIX reveal that the labour income component accounts for an average of 57 per cent of personal income. Farm income is highest in Saskatchewan, Alberta, Manitoba, and Prince Edward Island. Large percentages of farm income are associated with lower than average labour income percentages. There is a tendency for large percentages of transfer incomes to be associated with lower percentages of property incomes. This applies particularly to the Atlantic provinces. During the 1941 to 1961 period, transfer and labour components become an increasing percentage of personal income, while the remaining components declined. Labour income expanded from an average of 51 per cent in 1941 to 61 per cent in 1961. Transfer income increased from an average of 4 per cent to 14 per cent over the

¹⁵ Labour income refers to wages, salaries, and supplementary labour income; farm income refers to net income received by farm operators for farm production; non-farm income refers to net income received by non-farm unincorporated business; property income refers to interest, dividends and net rental income of persons; transfer payments refer to government transfer payments excluding interest. For details of definitions see: D.B.S., *National Accounts, Income and Expenditure, 1926 - 56* (Ottawa: Queen's Printer, 1962), pp. 114 - 116 and pp. 175 ff.

TABLE XXIX

COMPOSITION OF PERSONAL INCOME, BY PROVINCES
 (Percentages^a of personal income)
 1941, 1951, 1961

Province ^b	Labour income			Farm income			Non-farm income			Property income			Transfer income		
	'41	'51	'61	'41	'51	'61	'41	'51	'61	'41	'51	'61	'41	'51	'61
Ontario	67	69	68	7	6	3	10	9	7	13	9	12	3	6	10
British Columbia	68	67	66	4	3	2	14	12	9	10	9	10	5	9	12
Alberta	46	49	59	32	28	11	10	10	9	8	7	9	4	6	12
Manitoba	55	58	62	18	17	7	12	11	9	11	8	10	4	7	13
Saskatchewan	36	31	47	39	47	21	9	7	9	8	7	8	7	7	15

Canada	51	58	61	15	14	6	10	11	9	10	8	9	4	9	14

Quebec	68	68	68	7	6	2	11	9	7	11	9	10	3	8	13
Nova Scotia	70	66	64	5	4	1	12	13	10	9	7	9	4	11	16
New Brunswick	63	63	63	11	7	2	13	13	9	10	7	8	4	11	18
Prince Edward Island	39	40	51	26	26	8	13	13	13	17	8	8	4	13	21
Newfoundland	--	67	66	--	0	0	--	14	10	--	5	6	--	13	18

^aPercentages have been rounded.

^bRanked by 1941 - 61 average personal income per capita.

same period. Alternatively, farm income declined from 15 to 6 per cent, while non-farm and property income components show slight overall declines of less than 1 per cent.

There was more inter-provincial dispersion in labour, property, and transfer components in 1941 relative to the subsequent years, and less for farm and non-farm components.¹⁶ The least overall dispersion occurs with labour income, and the greatest with farm income. The farm income component singularly becomes more disperse from 1941 (226 per cent) to 1961 (368 per cent), although the non-farm component expands its dispersion less notably from 48 to 65 per cent during the same period. The remaining components, property and transfer incomes, become less disperse from 1941 to 1961 but less abruptly than the narrowing of labour income.

When labour and farm incomes are combined, they account for an average of 70 per cent of personal income, and there is very little dispersion. In 1961, the combination varies only from 59 per cent in Prince Edward Island (where the percentage non-farm component is largest) to 71 per cent in Ontario (where the percentage non-farm component is second smallest). There is a strong direct relationship between the proportion of personal income this combination produces and levels

¹⁶The relative ranges (that is, the absolute range divided by the mean) for 1941 and 1961 respectively are: labour income, 61 and 34 per cent; farm income, 226 and 368 per cent; non-farm income, 48 and 65 per cent; property income, 93 and 66 per cent; transfer income, 105 and 79 per cent; and labour-farm income, 19 and 17 per cent.

of personal income per capita, in 1961.¹⁷ For the remaining components there are strong relationships directly between property income levels and personal income (.76), and inversely between transfer income levels and personal income (-.93) in 1961. In the same year, a fairly strong inverse relationship occurs for non-farm and personal income levels (-.54). None of the income components, including the combined labour-farm component, produced significant rank correlations with personal income levels in 1941.

The different behaviours of the provincial income components afford some insights into the sources of the observed differences in provincial per capita personal income levels. It is difficult to generalize from the 1941 data as the levels of specific components are not clearly related to personal income levels. By 1961, however, a distinct pattern of relationship has emerged. The levels of the combined labour-farm component, together with property incomes, are strongly related directly to personal income levels. In that year, too, the transfer component is closely related inversely to personal income levels, while the non-farm component shows a similar, but weaker, direction of effect.

It would appear, then, that higher levels of personal income per capita are associated with higher proportions of personal income from

¹⁷The rank correlation coefficient between per capita personal income and labour-farm income in 1961 is .77, significant at the 0.05 level. Rank correlation coefficients between personal income per capita and provincial percentage components for 1941 and 1961 are respectively: labour income, .45 and .46; farm income, .07 and .34; non-farm income, .08 and -.54; property income, .26 and .76; transfer income, -.22 and -.93; labour-farm income, .36 and .77. Required significance level at the 0.05 figure is .64, and at the 0.01 figure is .83.

labour-farm and property components and lower proportions of transfer and non-farm components. There is a distinct tendency for increasing proportions of personal income from the transfer component to be associated with lower levels of personal income per capita and, hence, per pupil education expenditures. The strength of this association, particularly in the later period, suggests that the redistribution of income by transfer payments is not effecting a solution to the economic problem faced by the lower income provinces. This problem is to modify the structure of production.¹⁸

Prince Edward Islands affords a case in point. From 1941 to 1961 the farm income component declined by 69 per cent and property income by 53 per cent. While the non-farm component remained stable, labour income increased by 31 per cent and transfer payments by 425 per cent.¹⁹ This situation is generally applicable to each of the Atlantic provinces and Quebec. Each of these provinces displays higher than

¹⁸ For a theoretical discussion of the effects of income redistribution see, Jean Fourastié, *The Causes of Wealth* (Illinois: The Free Press of Glencoe, 1960), pp. 138ff.

¹⁹ Rates of growth for percentage income components, from Table XXIX, from 1941 to 1961 are as follows:

Province	Labour	Farm	Non-Farm	Property	Transfer
	%	%	%	%	%
Prince Edward Island	31	- 69	0	- 53	425
Nova Scotia	- 9	- 80	- 17	0	300
New Brunswick	0	- 72	- 31	- 20	350
Quebec	0	- 71	- 36	- 9	333
Ontario	1	- 57	- 30	- 8	233
Manitoba	13	- 62	- 25	- 9	225
Saskatchewan	30	- 47	0	0	114
Alberta	29	- 66	- 10	13	200
British Columbia	- 3	- 50	- 36	0	150

average rates of growth for the transfer component, and greater than average proportional declines in the farm component. Further, each of the remaining components either remains stable or declines. On the other hand, the proportional declines in the applicable components for the remaining provinces are less, and the farm component decline is notably less. These provinces (British Columbia, Ontario, and the Prairies) are further marked, generally, by advances in the labour component and lower than average increases in the transfer component.

Summary

The second phase of part two of the empirical analysis examined inter-provincial differences in X_1 (Education Expenditures) and X_9 (Personal Income). Initially, inter-provincial differences in levels of these variables were studied descriptively. The statistical descriptions of disparities included comparisons of raw data, and of provincial indexes computed from these data. Provincial per pupil expenditures were further studied in their relation to levels of provincial personal income per capita as proportions of income, in terms of income elasticities, and by application of the regression function between these two variables in order to predict levels of per pupil expenditures from personal income levels.

The provinces were examined in terms of these descriptive statistics and generalizations were made regarding the apparent Effort of each province.

Per pupil expenditure levels, predicted from personal income per capita levels, were examined in relation to decennial proportions

of pupils in A.D.A. to total provincial populations. This examination suggested that predicted proportions of personal income to be spent on education tended to parallel provincial proportions of pupils in A.D.A. In effect, those provinces with lower proportions of pupils in A.D.A. could afford to devote proportionally more of their personal incomes to education expenditures.

This finding was further examined in terms of the provincial proportions of personal income per potential work force member devoted to education expenditures. This income measure eliminated crude dependency differentials among provinces by concentrating attention upon disparities in the working-age populations. It was suggested that the separate provinces were expected to spend different proportions of their personal incomes on education; the higher income provinces spending more, and the lower income provinces spending less. In the result, it was possible to provide another dimension of Effort by comparing the predicted against the actual proportions of personal income devoted to education expenditures per pupil.

Comparisons of Effort findings in this study, regarding inter-provincial disparities in education expenditures, were made with selected earlier studies carried out in Canada. Differences in definitions of original data were shown to be responsible for variations in provincial Effort indices. It was suggested that the measures employed in this study were more rigorously defined since they excluded capital and debt service expenditures, and the data were computed on a per pupil in A.D.A. basis after deflation for price changes.

Examination of the relative provincial proportions of personal income components afforded some insights into the sources of observed differences in levels of personal income per capita. Higher levels of personal income appeared to be associated with higher proportions of labour-farm and property components, and lower proportions of transfer and non-farm components. It was noted that increasing proportions of transfer components tended to be associated with lower levels of personal income per capita. Again, it was inferred that these relationships with personal income were applicable to per pupil education expenditures.

PER PUPIL EDUCATION EXPENDITURES AND NON-POLICY DETERMINANTS

The third phase of part two of the empirical analysis involves the examination of inter-provincial differences in selected Non-Policy or Socio-Economic determinants of education expenditures. The multiple regression analyses of part one revealed that X_9 (Personal Income) exerted the dominant consistent influence on levels of per pupil education expenditures, X_1 . The only other independent variables to show consistently significant influences in these analyses were X_8 (Income Distribution) and X_{13} (Primary Industry). The latter variable, however, operated as a suppressant variable. Since intricate inter-relationships existed among Non-Policy independent variables, particularly in terms of statistically synonymous variables, factor analyses were applied to determine clusters of related variables. In the result, three factors or clusters of commonly related variables were produced. It will be instructive to examine inter-provincial differences in terms of these factors.

The technique adopted in this, and the following, phase is the examination of inter-provincial differences in provincial indexes for the relevant variables. Provincial indexes are computed by expressing the variable data as percentages of the national means. Hence, provincial indexes were computed for the three decennial periods, 1941, 1951, and 1961. Rather than examining each of these decennial indexes separately, it was decided to average the variable indexes for the overall period. Since this phase is a minor aspect of the study, the consequent loss in detail is not important.

Non-Policy Factor 1

In the 1941 and 1951 analyses, Factor 1 was the dominant factor. This factor appears strongly in X_{10} (Number of Dependents), X_8 (Income Distribution), and X_2 (School-age Population) in a positive manner, and negative in X_4 (Urbanization), X_6 (Population Education Level), and X_9 (Personal Income). Hence, those areas possessing this factor are marked by higher proportions of school-age children and dependents, wider variations in income distribution, less urbanization, lower population education levels, lower personal incomes and, by inference, lower per pupil education expenditures.

Table XXX provides the average 1941 to 1961 provincial indexes for the variables of Factor 1, together with average provincial indexes for X_1 (Education Expenditures). These data have been illustrated in Figure 8. The data of Table XXX, and the illustration of Figure 8, reveal marked regional homogeneity in the variables of Factor 1.

The Atlantic region provinces are marked by lower levels of per pupil expenditures and personal incomes, lower urbanization and population

TABLE XXX

PROVINCIAL INDEXES FOR NON-POLICY FACTOR 1
 (Average 1941-61 Indexes)
 CANADA = 100

Province ^a	x ₁ ^b	x ₄ ^b	x ₆ ^b	x ₉ ^b	x ₂ ^b	x ₈ ^b	x ₁₀ ^b
British Columbia	150	161	138	135	75	86	88
Ontario	126	161	120	140	97	85	83
Alberta	124	102	113	118	91	94	90
Saskatchewan	115	57	91	108	95	104	95
Manitoba	112	121	109	112	86	94	88
-----	-----	-----	-----	-----	-----	-----	-----
Canada	100	100	100	100	100	100	100
-----	-----	-----	-----	-----	-----	-----	-----
Quebec	94	148	83	99	116	93	97
New Brunswick	83	68	79	76	114	100	114
Nova Scotia	80	85	110	87	117	109	106
Prince Edward Island	62	44	98	65	99	118	111
Newfoundland	50	51	56	57	110	115	136

^aRanked by 1941-61 average education expenditures.

^bFor details of variables refer to Table II, page 92.

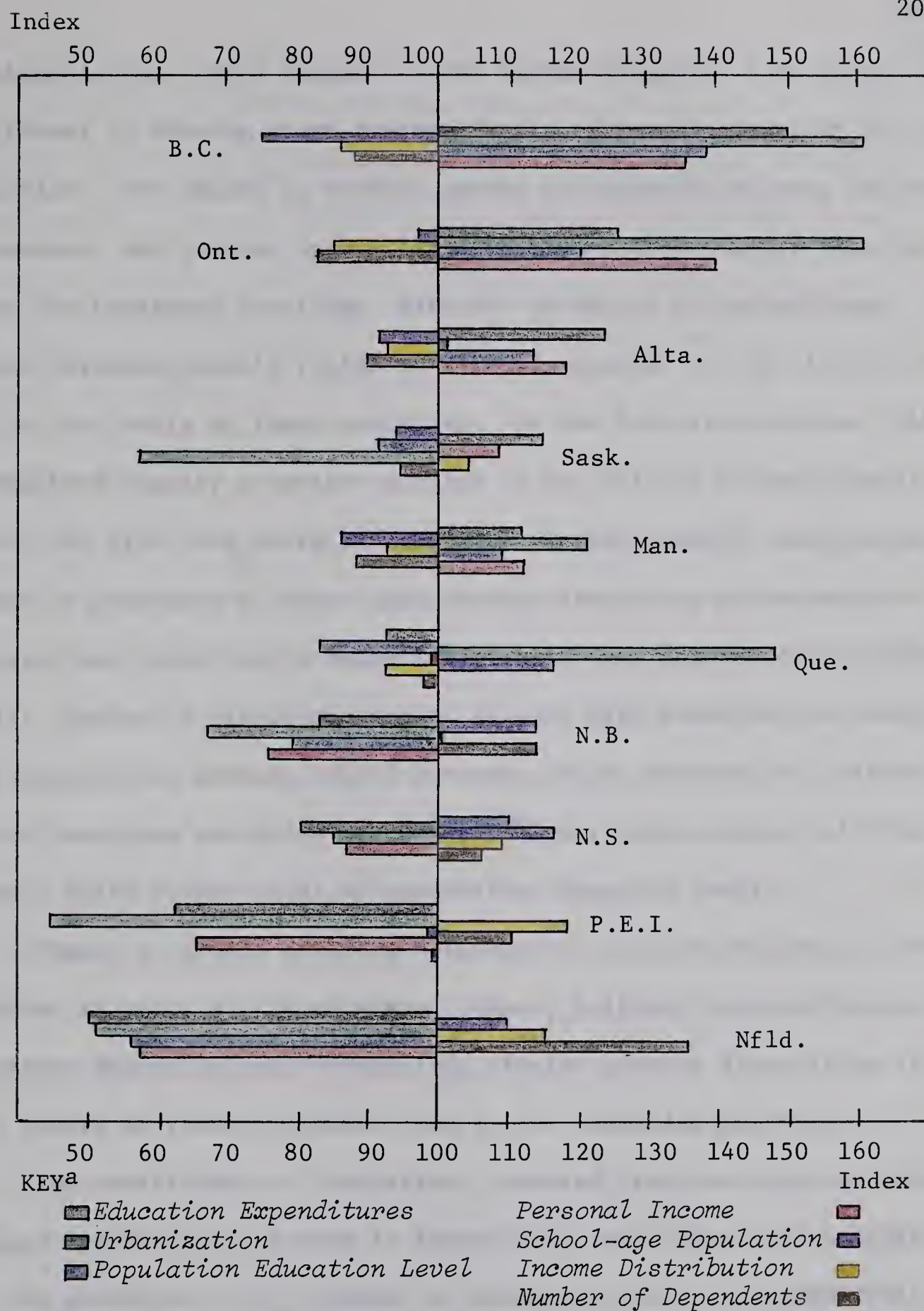


Figure 8. Provincial Indexes for Non-Policy Factor 1 -
Deviations from Canada Average (100)

^aFor details of variables refer to Table II, p. 92.
Source: Table XXX, p. 204.

education levels. With respect to the latter variable, Nova Scotia is exceptional in showing above average levels of formal education for its population. The region is further marked by higher dependency and school-age indexes, and greater inequalities in income distribution than for any of the remaining provinces, with the exception of Saskatchewan. The British Columbia/Ontario region is directly counter to the Atlantic region in its levels of these variables. Of the Prairie provinces, Alberta and Manitoba display a pattern similar to the British Columbia/Ontario region, but with less overall disparity. Saskatchewan is distinctive in that it possesses a higher than average inequality of income distribution and lower than average urbanization and population education levels. Quebec is singularly marked by very high urbanization levels and a higher than average school-age population, whereas its indexes for the remaining variables are somewhat lower than average, with the nation's third lowest level of population education levels.

Figure 8 reveals a strong tendency for wider variations in these variables to occur at the extremes. Hence, British Columbia/Ontario and Prince Edward Island/Newfoundland display greater disparities in their levels of these variables than do the remaining provinces.

The coefficients of variation, computed from the original data of these variables (contained in Appendix B), show that all variables with the exception of X_{10} (Number of Dependents) have narrowed their dispersion from 1941 to 1961. The coefficient of variation for X_2 (School-age Population) has declined from 16.0 in 1941 to 12.3 in 1961; for X_4 (Urbanization) from 51.5 to 40.5; for X_6 (Population Education Level) from 29.4 to 19.0; for X_9 (Personal Income) from 33.3 to

24.1; and for X_1 (Education Expenditures) from 33.4 to 31.4. With these variables, the second largest dispersion remains with X_1 (Education Expenditures). The coefficient for X_{10} (Number of Dependents) has singularly expanded, from 12.6 in 1941 to 20.9 in 1961. Much the greater part of this growth in dispersion has occurred in the Atlantic provinces and Quebec.

Non-Policy Factor 2.

The contributions of Factor 2 declined in importance throughout the previous decennial factor analyses. This factor appears very strongly in X_2 (School-age Population) and X_7 (Roman Catholic Population) in positive directions, and X_6 (Population Education Level) in a negative direction. Variables X_5 (Migration) and X_9 (Personal Income) appear less strongly in a negative manner. Hence those areas possessing this factor are marked by lower population education levels, lower personal incomes, relatively high out-migrations, higher proportions of Roman Catholics and school-age children, and by inference, lower per pupil education expenditures.

Table XXXI provides the average 1941-61 provincial indexes for the variables of Factor 2, together with average provincial indexes for X_1 (Education Expenditures). These data are illustrated in Figure 9.

The Atlantic region provinces are distinguished by greater than average school-age proportions of population and considerably higher ratios of Roman Catholics to total population. These positive variables are associated with lower levels of personal income and per pupil expenditures, and generally lower indexes for population education levels.

TABLE XXXI

PROVINCIAL INDEXES FOR NON-POLICY FACTOR 2
 (Average 1941-61 indexes)
 CANADA = 100

Province ^a	X ₂ ^b	X ₇ ^b	X ₆ ^b	X ₅ ^b	X ₉ ^b	X ₁ ^b
British Columbia	75	41	138	282	135	150
Ontario	97	71	120	160	140	126
Alberta	91	60	113	103	118	124
Saskatchewan	95	71	91	20	108	115
Manitoba	86	65	110	60	112	112
-----	-----	-----	-----	-----	-----	-----
Canada	100	100	100	100	100	100
-----	-----	-----	-----	-----	-----	-----
Quebec	116	240	83	112	99	94
New Brunswick	114	138	79	75	76	83
Nova Scotia	117	93	110	90	87	80
Prince Edward Island	99	125	98	50	65	62
Newfoundland	110	93	56	72	57	50

^aRanked by 1941-61 average education expenditures.

^bFor details of variables refer to Table II, p. 92.

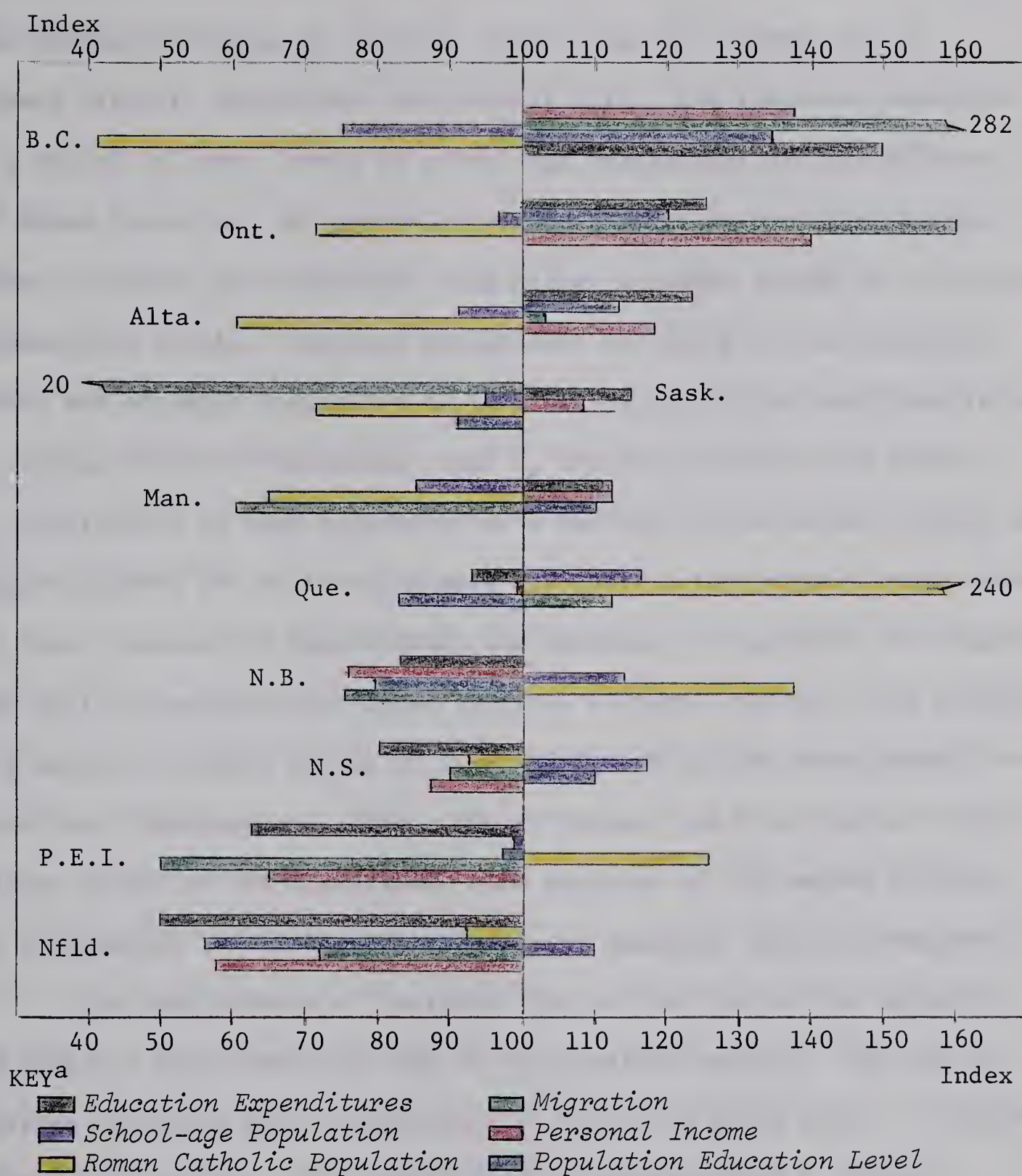


Figure 9. Provincial Indexes for Non-Policy Factor 2 -
Deviations from Canada Average (100)

^aFor details of variables refer to Table II, p. 92.
Source: Table XXXI, p. 208.

The pattern in Quebec is similar, except that its indexes for X_7 (Roman Catholic Population) are notably high. The remaining provinces are marked by lower levels of school-age populations and proportions of Roman Catholics, and generally higher population education levels. These variables are associated with higher personal income and per pupil expenditure levels. Regional homogeneity is strong in the variables which are strongly indicative of this factor; X_2 (School-age Population), X_7 (Roman Catholic Population), and X_6 (Population Education Level). X_5 (Migration) is less successful as a regional differentiator since the higher indexes for British Columbia and Ontario are largely counteracted by lower indexes for Saskatchewan and Manitoba. In general, the higher per pupil expenditure provinces (British Columbia, Ontario, and Alberta) are marked by higher levels of in-migration while the lower expenditure provinces (Newfoundland, Prince Edward Island, and Nova Scotia) exhibit higher levels of out-migrations. The addition of the weaker variable X_5 (Migration) in this factor reduces the apparent regional homogeneity.

The coefficients of variation for all but two of the variables of Factor 2 have been described in the previous section. The two remaining variables have coefficients of variation which react in similar, singular directions. The coefficient of variation for X_7 (Roman Catholic Population) has expanded from 56.6 in 1941 to 61.3 in 1951, then declined to 55.1 in 1961. Similarly, for X_5 (Migration) an expansion occurs from 38.8 in 1941 to 51.9 in 1951 followed by a decline to 26.6 in 1961. The narrowing in dispersion is greater in X_5 (Migration) than in X_7 (Roman Catholic Population).

Non-Policy Factor 3

The contributions of the third factor increased in importance throughout the previous factor analyses. The third factor appears strongly in X_{13} (Primary Industry) negatively, and in X_4 (Urbanization) and X_5 (Migration) positively. Variable X_9 (Personal Income) appears less strongly, positively. Hence those areas possessing this factor are marked by high degrees of urbanization and little out-migration, higher personal incomes, lower proportions of the labour force in primary industry, and, by inference, higher levels of per pupil education expenditures.

The data for the variable indexes of Factor 3 are given in Table XXXII. Figure 10 illustrates this data. As shown in the figure, there is considerably less regional homogeneity among the variables of this factor.

The two provinces at each end of the distribution are most clearly distinguished in the variables of Factor 3. British Columbia and Ontario exhibit lower proportions of population in primary industry and higher levels of urbanization and in-migration. Further, these provinces are marked by higher personal incomes and per pupil expenditures. Newfoundland and Prince Edward Island are directly counter to these directions. The remaining provinces are much less clearly distinguished in Factor 3. Alberta is identical with British Columbia/Ontario except for its higher proportions of labour force in primary industries. Saskatchewan and Manitoba have relatively high primary industry levels and higher levels of out-migrations, with Saskatchewan further distinguished by lower urbanization levels. Quebec exhibits lower levels of primary industry

TABLE XXXII

PROVINCIAL INDEXES FOR NON-POLICY FACTOR 3
 (Average 1941-61 indexes)
 CANADA = 100

Province ^a	x_{13}^b	x_4^b	x_5^b	x_9^b	x_1^b
British Columbia	51	161	282	135	150
Ontario	49	161	160	140	126
Alberta	128	102	103	118	124
Saskatchewan	179	57	20	108	115
Manitoba	98	121	60	112	112

Canada	100	100	100	100	100

Quebec	59	148	112	99	94
New Brunswick	93	68	75	76	83
Nova Scotia	80	85	90	87	80
Prince Edward Island	162	44	50	65	62
Newfoundland	102	51	72	57	50

^aRanked by 1941-61 average education expenditure.

^bFor details of variables refer to Table II, p. 92.

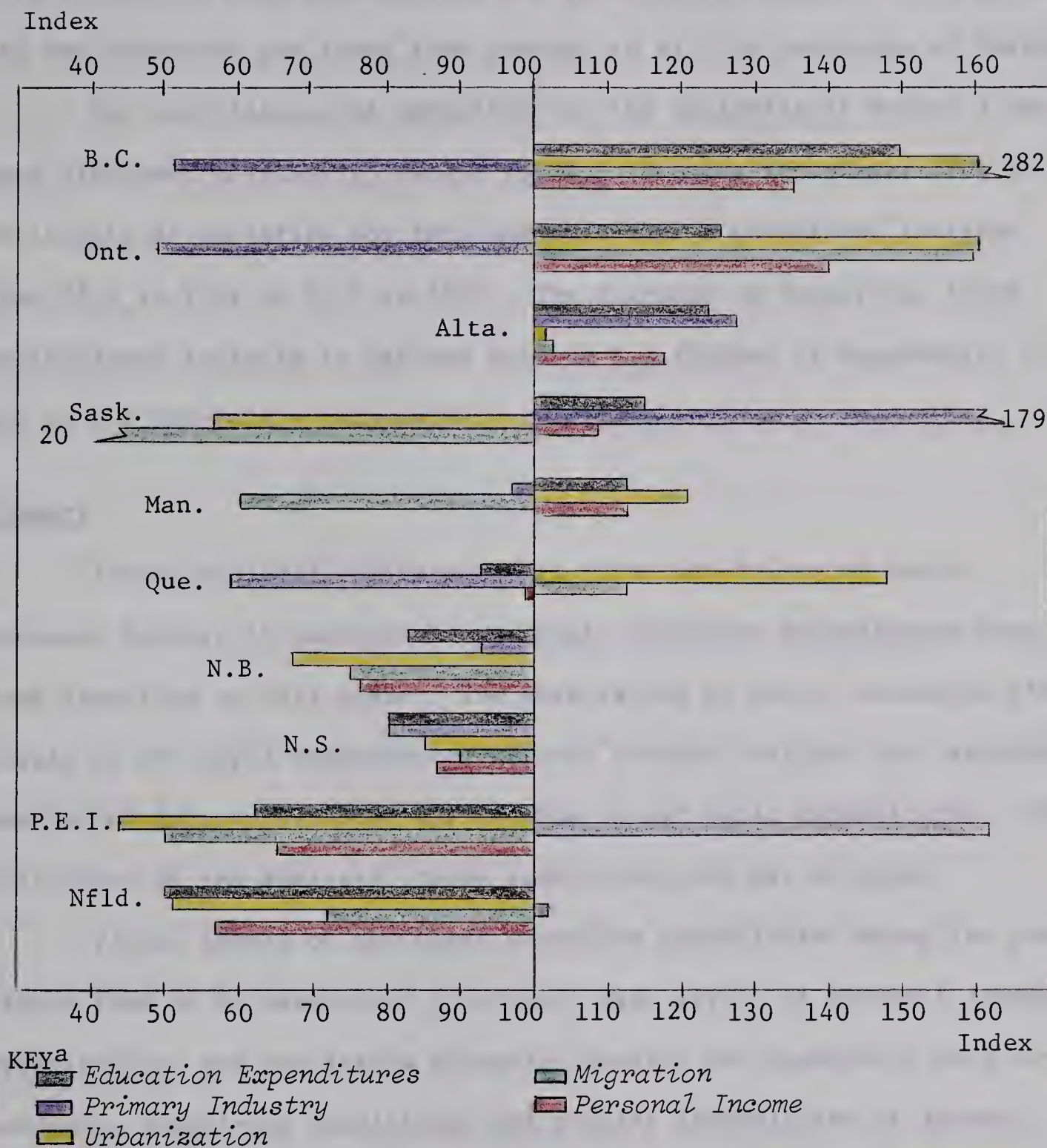


Figure 10. Provincial Indexes for Non-Policy Factor 3 -
Deviations from Canada Average (100)

^aFor details of variables refer to Table II, p. 92.
Source: Table XXXIII, p. 217.

with relatively high urbanization and in-migration levels. Nova Scotia and New Brunswick are lower than average in all the variables of Factor 3.

The coefficients of variation for the variables of Factor 3 have been discussed previously, except for X_{13} (Primary Industry). The coefficients of variation for this variable show a persistent increase from 35.4 in 1941 to 55.7 in 1961. The increase in dispersion these coefficients indicate is matched only by X_{10} (Number of Dependents) in all of the Non-Policy independent variables.

Summary

Inter-provincial differences in three Non-Policy or Socio-Economic factors in relation to per pupil education expenditures have been described in this phase. The association of factor variables with levels of per pupil expenditures affords further insights into apparent sources of inter-provincial differences in per pupil expenditures. From this phase of the analysis, three generalizations may be drawn.

First, levels of per pupil education expenditures among the provinces tend to be associated positively with levels of personal income, urbanization, and population education levels; and negatively with dependency, school-age populations and greater inequalities of income distribution (Factor 1). The exceptions to this generalization are Quebec (urbanization is negative), Nova Scotia (population education level is negative), and Saskatchewan (urbanization and population education level are negative; greater inequality of income distribution is positive).

Secondly, levels of per pupil education expenditures among the provinces tend to be associated negatively with school-age population,

and proportions of Roman Catholics in the population; and positively with population education levels and personal incomes (Factor 2). The exceptions to this generalization are, again, Saskatchewan and Nova Scotia (for population education levels).

Thirdly, levels of per pupil education expenditures among the two highest level provinces (British Columbia and Ontario) are further associated with higher levels of in-migration (Factor 2), and lower proportions of primary industry workers (Factor 3). The reverse applies for the two lowest level per pupil expenditure provinces (Newfoundland and Prince Edward Island).

PER PUPIL EDUCATION EXPENDITURES AND POLICY DETERMINANTS

The final phase of part two of the empirical analysis is identical to the previous phase except that inter-provincial differences in the two Policy or Political factors are examined. Again, the examination proceeds by way of the average of the three decennial indexes for the relevant variables.

Policy Factor 1.

The first factor contributed markedly to the 1941 and 1951 factor analyses in the previous part. This factor is strongly composed of X_{14} (Enrolments Beyond Leaving Age), X_{16} (School Size), X_{18} (Teacher Salaries), and X_{19} (State Aid). Those areas possessing this factor are marked by higher proportions of enrolments beyond statutory leaving ages, higher amounts of state aid per pupil, fewer schools per 5000 pupils, higher teacher salaries and, by inference, higher per pupil education expenditures.

Table XXXIII provides the data for average provincial indexes of the variables of Factor 1, together with average provincial indexes for X_1 (Education Expenditures). These data are illustrated in Figure 11.

The Atlantic region provinces display notable homogeneity in the data of Table XXXIII and Figure 11. These provinces are characterized by smaller schools, fewer enrolments beyond the statutory leaving ages, lower teacher salaries, lower amounts of state aid per pupil, and lower per pupil education expenditures. Newfoundland provides the single exception to this general pattern in having larger than average amounts of state aid per pupil. Quebec is singularly marked by larger schools, lower proportions of enrolments beyond statutory leaving ages, the nation's lowest average teacher salaries and amounts of state aid per pupil, and lower than average per pupil expenditures. The Prairie provinces are not so clearly differentiated regionally. Saskatchewan and Manitoba have higher levels of teacher salaries, enrolments beyond leaving ages, and per pupil expenditures. These positive variables are associated with smaller schools and above average state aid per pupil (for Saskatchewan), and lower than average state aid (for Manitoba). Alberta, British Columbia, and Ontario, the three highest expenditure provinces, are characterized by higher teacher salaries, larger schools, and higher than average amounts of state aid per pupil. Alberta and British Columbia are further marked by higher levels of enrolments beyond statutory leaving ages, while Ontario's level in this variable is well below the national average.

The coefficients of variation for the variables of Factor 1 show a narrowing of inter-provincial variations, from 1941 to 1961, for all

TABLE XXXIII

PROVINCIAL INDEXES FOR POLICY FACTOR 1
 (Average 1941-61 indexes)
 CANADA = 100

Province ^a	X ₁₄ ^b	X ₁₆ ^b	X ₁₈ ^b	X ₁₉ ^b	X ₁ ^b
British Columbia	167	44	72	175	150
Ontario	63	59	84	101	126
Alberta	157	78	85	119	124
Saskatchewan	144	130	93	108	115
Manitoba	137	93	88	80	112
-----	-----	-----	-----	-----	-----
Canada	100	100	100	100	100
-----	-----	-----	-----	-----	-----
Quebec	62	83	148	55	94
New Brunswick	52	110	100	75	83
Nova Scotia	54	112	101	77	80
Prince Edward Island	79	184	110	96	62
Newfoundland	85	107	122	115	50

^aRanked by 1941-61 average education expenditure.

^bFor details of variables refer to Table II, p. 92.

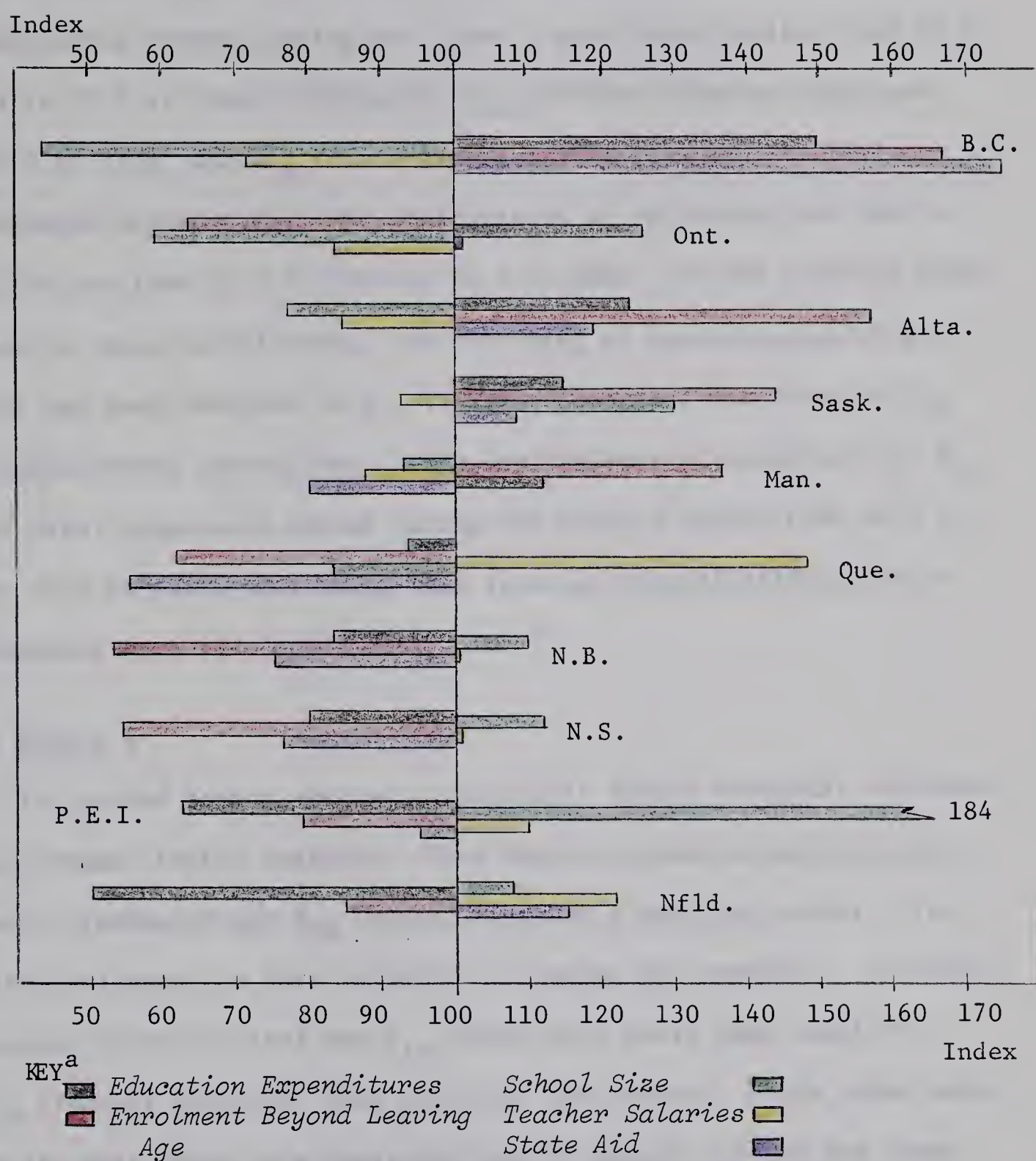


Figure 11. Provincial Indexes for Policy Factor 1 - Deviations from Canada Average (100)

^aFor details of variables refer to Table II, p. 92.

Source: Table XXXIV, p. 220.

variables except X_{16} (School Size). The coefficients of variation for X_{14} (Enrolments Beyond Leaving Age) show a persistent decline from 57.5 in 1941 to 35.7 in 1961. Similarly, X_{18} (Teacher Salaries) declines from 30.3 to 15.9; and X_{19} (State Aid) declines from 47.1 to 31.5. X_1 (Education Expenditures) has coefficients of variation that show a modest decline from 33.3 in 1941 to 31.4 in 1961. In the relative terms provided by these coefficients, the narrowing of inter-provincial differences has been sharpest in X_{18} (Teacher Salaries) and least in X_{14} (Enrolments Beyond Leaving Age). The coefficients of variation for X_{16} (School Size) singularly expand during the overall period from 38.9 in 1941 to 52.4 in 1961, indicating that inter-provincial differences in this variable have advanced sharply.

Policy Factor 2

The second factor exerted a relatively stable decennial influence in the previous factor analyses. This factor appears strongly in X_{15} (Number of Teachers) and X_{16} (School Size) in a positive manner. The negative influences in this variable are weaker and unstable. Variables X_{17} (School District Size) and X_{19} (State Aid) exert some negative, and X_{18} (Teacher Salaries) some positive, influences. Hence those areas possessing this factor are characterized by smaller schools and lower pupil-teacher ratios, with a tendency for smaller school districts, lower amounts of state aid per pupil, lower teacher salaries and, by inference, lower per pupil education expenditures.

Table XXXIV provides the data for provincial average indexes for the variables of Factor 2, together with average provincial indexes for X_1 (Education Expenditures). These data are illustrated in Figure 12.

TABLE XXXIV
 PROVINCIAL INDEXES FOR POLICY FACTOR 2
 (Average 1941-61 indexes)
 CANADA = 100

Province ^a	X ₁₅ ^b	X ₁₆ ^b	X ₁₈ ^b	X ₁₇ ^b	X ₁₉ ^b	X ₁ ^b
British Columbia	96	44	72	356	175	150
Ontario	75	59	84	67	101	126
Alberta	101	78	85	65	119	124
Saskatchewan	113	130	93	33	108	115
Manitoba	101	93	88	35	80	112
-----	-----	-----	-----	-----	-----	-----
Canada	100	100	100	100	100	100
-----	-----	-----	-----	-----	-----	-----
Quebec	115	83	148	147	55	94
New Brunswick	102	110	100	77	75	83
Nova Scotia	92	112	101	103	77	80
Prince Edward Island	113	184	110	16	96	62
Newfoundland	92	107	122	100	115	50

^aRanked by average 1941-61 education expenditures.

^bFor details of variables refer to Table II, p. 92.

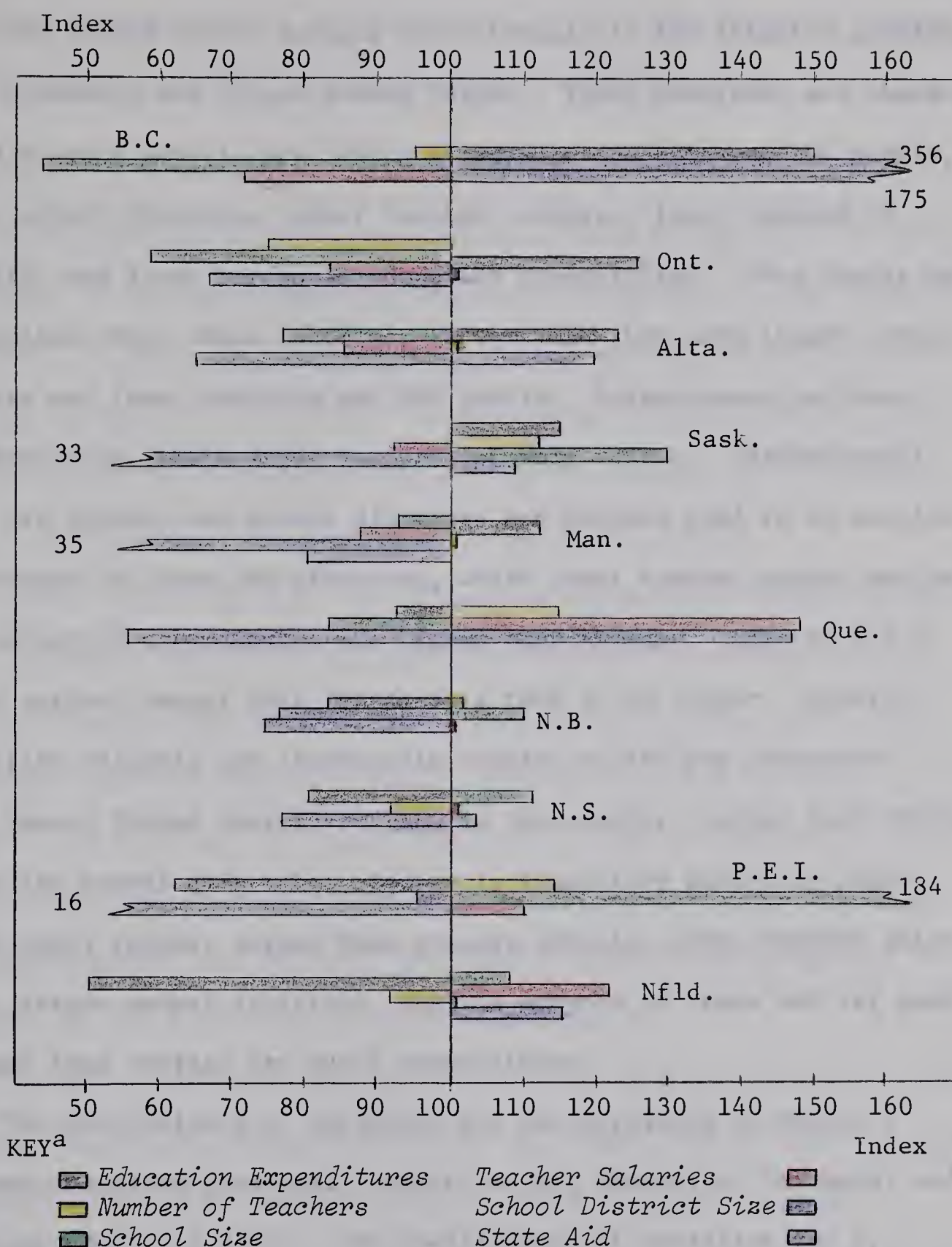


Figure 12. Provincial Indexes for Policy Factor 2 - Deviations from Canada Average (100)

^aFor details of variables refer to Table II, p. 92

Source: Table XXXV.

The second factor appears most strongly in the Atlantic provinces of New Brunswick and Prince Edward Island. These provinces are characterized by more schools per 5000 pupils, more teachers per 100 pupils, smaller school districts, lower teacher salaries, lower amounts of state aid, and lower per pupil education expenditures. Nova Scotia and Newfoundland share these features, except that they have larger school districts and fewer teachers per 100 pupils. Saskatchewan and Manitoba, similarly, share major features of this factor. Teacher-pupil ratios are higher, but school districts and schools tend to be smaller than average in these two provinces, while their teacher salary and per pupil education expenditures are higher than average. Alberta has a similar pattern except that its schools tend to be larger. Ontario and British Columbia are identically counter to the New Brunswick/Prince Edward Island characteristics in this factor, except that Ontario has smaller school districts. Quebec is singularly marked by higher teacher-pupil ratios, larger than average schools, lower teacher salary levels, larger school districts, smaller amounts of state aid per pupil, and lower than average per pupil expenditures.

The coefficients of variation for the variables of Factor 2 have been described previously except for X_{15} (Number of Teachers) and X_{17} (School District Size). The coefficients of variation for X_{15} (Number of Teachers) decline persistently from 20.8 in 1941 to 7.4 in 1961, indicating a sharp narrowing of inter-provincial variation. For X_{17} (School District Size) the coefficients of variation behave somewhat chaotically, reflecting the weakness of this measure. They expand from 79.0 in 1941 to 181.3 in 1951 and decline thereafter to 96.2. Whatever

weaknesses are intrinsic to this measure, these coefficients do reveal a marked inter-provincial variation in this variable.

Summary

Inter-provincial differences in two Policy or Political factors in relation to per pupil education expenditures have been described in this phase. Again, the association of factor variables with levels of per pupil education expenditures affords insights into apparent sources of inter-provincial differences in per pupil expenditures. From this phase of the analysis, two generalizations may be drawn.

First, levels of per pupil education expenditures among the Atlantic provinces and the three highest expenditure provinces (British Columbia, Ontario, and Alberta) are associated positively with levels of teacher salaries, size of schools, enrolments beyond statutory leaving ages, and state aid per pupil (Factor 1). The exceptions to this generalization are Newfoundland (state aid is positive with lower per pupil expenditures) and Ontario (enrolments beyond leaving ages is negatively associated with per pupil expenditures).

Secondly, levels of per pupil education expenditures in British Columbia, Ontario, New Brunswick and Prince Edward Island are associated positively with size of school, size of school district, levels of teacher salaries and state aid; and negatively with teacher-pupil ratios (Factor 2). Levels of per pupil education expenditures are similarly associated in Nova Scotia and Newfoundland (except for size of school districts being negative and teacher-pupil ratios positive); and Saskatchewan and Manitoba (except for teacher-pupil ratios being positive, school district and school size being negative).

SUMMARY

This chapter has given the findings of part two of the empirical analyses, which involved the examination of inter-provincial differences in selected variables. The major statistical technique used in the analysis of inter-provincial differences was provincial indexes, in which the original variable data were expressed as percentages of the national means. The empirical analyses were organized into four phases based on the findings of part one.

The initial phase of this part of the analysis provided statistical descriptions of disparities in levels of per pupil education expenditures. These disparities were examined, in the second phase, in their relation to inter-provincial differences in levels of personal income per capita in each of the decennial periods. The final two phases applied the findings of the factor analyses of part one to the examination of inter-provincial differences in levels of the three Non-Policy and two Policy factors in relation to levels of provincial per pupil education expenditures. In these several ways, insights were afforded into apparent sources of inter-provincial differences in levels of per pupil education expenditures.

The empirical analyses of this study were divided into two parts, of which part one constituted the major focus of the study. Following the reporting of the findings of part two in this chapter, the final chapter is devoted to the summary and conclusions of this study.

CHAPTER VI

SUMMARY AND CONCLUSIONS

This study has been concerned with an analysis of determinants of education expenditures per pupil in A.D.A. in public elementary and secondary schools, decennially 1941 to 1961, among the provinces of Canada. It has involved: (1) the formulation of a theoretical model of public education expenditure determinants, (2) a systematic statistical analysis of determinants of public education expenditures in Canada with variables derived from the theoretical model, and (3) an examination of inter-provincial differences in levels of per pupil education expenditures and selected determinants. The present chapter will summarize the major findings, and suggest areas for future research.

The theoretical model formulated as a basis for the empirical analyses of this study was developed retroductively from the literature. The model classified determinants of education expenditures into two major theoretical categories: Non-Policy or Socio-Economic determinants, and Policy or Political determinants. The distinction between these two categories was a logical one, based on the ease with which the determinants were seemingly capable of being manipulated by policy-makers. It was proposed that the Non-Policy determinants were less susceptible to manipulation, being essentially immanent characteristics of a community, and invariant in the short-run. In contrast, the Policy determinants were proposed as being capable of manipulation, hence variable in the short-run. This distinction provided a logical basis for separating statistically synonymous variables for the purposes of the empirical analyses.

The investigation of both Non-Policy and Policy determinants was constrained by the small number of provinces (ten). This small number of cases forced the necessity for relatively high significance levels in the statistical analyses. In consequence, very strong associations between variables had to be achieved in order to provide results which could be considered significant. The investigation of Policy determinants was further constrained by the lack of available data. Consequently the selected Policy variables were not as illustrative of the complex of factors classified as Political determinants as intended. In every instance weaker results were achieved in statistical analyses using Policy variables than in those employing the Non-Policy variables. The extent to which these weaker results accrued from the initial limitation in the selection of Policy variables is moot.

The statistical analyses employed the stepwise multiple regression procedure which determined the order of the predictor variables, from best to poorest. This procedure selected the unique serial combinations of predictor variables which best explained the variance in levels of per pupil education expenditures in each of the decennial periods, 1941, 1951, and 1961. A single combination of uniform predictor variables was not generated for each time period, rather the selected combination was irregular and idiosyncratic to the particular time period. To achieve uniformity, a few significant predictor variables were applied uniformly in the three periods for the stepwise regression analyses to yield the singular order of predictor variables in each year. The stepwise procedure was applied in these ways, first to the Non-Policy variables, then to the Policy variables, in each decennial period.

Some use was made of factor analysis to explore the relationships among the Non-Policy and Policy classes of predictor variables. Multiple factor solutions were sought and the varimax solution was reported as being nearest to the concept of "simple structure". Three factors were delineated among the Non-Policy variables, and two factors among the Policy variables. Each of these factors was essentially invariant throughout the three decennial analyses. No attempt was made to name the factors. The use of the factor analyses was entirely exploratory.

The major focus of this study was this statistical investigation of determinants of per pupil education expenditures in Canada. A minor focus of the study was the examination of inter-provincial differences in selected predictor variables, generated from the previous analyses, with a view to discovering some of the apparent sources of inter-provincial variations in levels of per pupil education expenditures. In the statistical descriptions of inter-provincial disparities, major use was made of the original variable data expressed as provincial indexes of the national means. Per pupil education expenditure differentials were investigated separately, then with personal income differentials and, finally, with related Non-Policy and Policy variables clustered as factors.

This study was, therefore, essentially an heuristic study of education expenditure determinants in Canada. The study marks the first attempt to apply multivariate statistical techniques to education expenditure data in Canada. An important by-product of the study has been the collection and computation of data for the variables used in this study.

MAJOR FINDINGS

The major findings of the study will be summarized under the following headings: (1) Non-Policy or Socio-Economic determinants, and (2) Policy or Political determinants.

Non-Policy or Socio-Economic Determinants

The major finding of this study was that levels of personal income per capita among the provinces explained between 83 and 93 per cent of the variance in levels of per pupil current expenditures for education. While personal income per capita was the dominant determinant of levels of per pupil education expenditures in the overall analyses, the number of dependents per 100 actual work force members emerged as the decisive determinant in the 1941 analysis. The 1941 analysis was further marked by the significant contribution of the per cent of population Roman Catholic as a predictor of levels of per pupil education expenditures, whereas this factor was relatively unimportant in the remaining two analyses. The extent of income inequality, as measured by the wage-earner income distribution index, was found to be an additionally important predictor of levels of per pupil education expenditures in each of the decennial analyses.

In a negative sense, it is important to note those factors which were discovered to be relatively unimportant in the analyses of determinants of per pupil education expenditures. Per cent of total population within statutory school-age limits, per cent of population within school-age limits enrolled in public schools, per cent of population living in urban centres of 10,000 or more, the index of migration, per

cent of population with 9 or more years formal education, per cent of school board revenues from provincial sources, and per cent of total revenues from non-property taxes were not notably helpful in the determination of current expenditures for education. Per cent of labour force in primary industry was found to be an important determinant in the 1961 analysis of levels of per pupil education expenditures, but its contribution was effected by its association with the other factors.

Further analysis showed that levels of personal income, hence per pupil education expenditures, were associated positively with levels of urbanization, in-migration, and population education levels; and negatively with dependency ratios, proportions of school-age children and Roman Catholics, and workers in primary industry in the population.

The computation of national income elasticities revealed that, in general, for every one per cent rise in per capita personal income less than one per cent was additionally spent for education expenditures per pupil, decennially 1941 to 1961. Lower elasticities occurred in 1941 and 1951, while the 1961 period produced elasticities approaching, or slightly over, one.

Examination of the relative provincial proportions of personal income components in each of the decennial periods suggested that higher levels of personal income were associated with higher proportions of labour-farm and property income components, and lower proportions of transfer and non-farm components. Furthermore, it was found that increasing proportions of transfer components tended to be associated with lower levels of personal incomes per capita.

Inter-provincial comparisons of the Non-Policy or Socio-Economic determinants of education expenditures per pupil produced the following findings:

British Columbia/Ontario. These two provinces constitute the highest per pupil education expenditure provinces in the overall period. They are characterized by higher levels of personal income per capita, of urbanization, of in-migrations, and of population education levels; and by lower levels of income inequalities, of dependency ratios, of school-age populations, of Roman Catholics, and of workers in primary industry. Each of these provinces displays close to the national average income elasticities for education expenditures, and lower than average ratios of growth for education expenditure levels, for proportions of personal income devoted to education expenditures, for secondary enrolments, and for teacher salary levels. British Columbia is further distinguished by higher proportions of personal income devoted to education spending and higher than predicted per pupil expenditures in terms of expectancies derived from income predictions. With respect to these two factors, Ontario exhibits a pattern counter to that of British Columbia.

The Prairies. The three Prairie provinces, Alberta, Saskatchewan, and Manitoba, are marked by higher than average per pupil education expenditures. Each of these provinces is characterized by higher levels of workers in primary industry; and by lower levels of school-age populations, dependency burdens, and Roman Catholics in the population. Alberta and Manitoba are further marked by lower levels of income inequality, and higher levels of urbanization and population education levels. Saskatchewan distinctively runs counter to Alberta and Manitoba

in its levels of these factors. Whereas Alberta is marked by higher levels of in-migration, both Manitoba and Saskatchewan have higher levels of out-migration. Each of these provinces has income elasticities which are close to the national average, higher proportions of personal income being spent on education, and lower than average rates of growth for secondary enrolments. Alberta and Saskatchewan are further distinguished by higher than predicted per pupil expenditure levels both in terms of their 1941 expenditure levels and their personal income levels, whereas Manitoba spent less than predicted in the more recent years of 1951 and 1961. Again, the growth in levels of teacher salaries and per pupil expenditures is notably higher than the national average for Alberta and Saskatchewan, but is less in Manitoba.

Quebec. With lower than average per pupil expenditure levels, Quebec is distinguished by relatively high levels of urbanization, of school-age population, of Roman Catholics, and of in-migration; and relatively low levels of personal income, of dependents, of primary industry workers, of income inequalities, and of population education levels. The province displays lower than average proportions of personal income devoted to education spending and its predicted expenditure levels are consequently higher than the actual expenditure levels. Quebec, however, is characterized by higher rates of growth in these factors. Further, its income elasticity of education expenditures, its growth in secondary enrolments, and its growth in levels of teacher salaries are all higher than the national averages for these factors.

The Atlantic. The four Atlantic provinces of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland, are lower per

pupil expenditure provinces. Each of these provinces is characterized by lower levels of personal income and urbanization; and higher levels of dependency, of school-age populations, of inequalities in income distribution, and of Roman Catholic population proportions. With the exception of Nova Scotia, the Atlantic provinces are further marked by lower population education levels and higher levels of out-migration. Newfoundland and Prince Edward Island are distinguished by relatively high proportions of workers in primary industries, whereas Nova Scotia and New Brunswick have slightly lower than average levels in this factor. With the exception of Nova Scotia, each of the Atlantic provinces is marked by lower than average income elasticities for education expenditures and proportions of personal income devoted to education spending. The four provinces are generally marked by greater than the national average growth in secondary enrolments and teacher salaries (with the exception of Prince Edward Island), and less spending on education than their respective personal income levels would anticipate (with the exception of New Brunswick, and of Nova Scotia in 1961). Of the four provinces, Nova Scotia ranks higher on indicators of growth.

Policy or Political Determinants

The analysis of the Policy determinants of per pupil current expenditures for education was extremely restricted in terms of the availability of data. In the 1941 analysis, per cent of pupils enrolled beyond statutory leaving ages was the dominant determinant, explaining 42 per cent of the variance in levels of per pupil education expenditures. Further analysis showed that this factor, and hence levels of per pupil expenditures, was associated positively with state aid per

pupil levels, and teacher salary levels; and negatively with school size. In the 1951 analysis, the decisive determinant of levels of per pupil education expenditures was the number of schools per 5000 pupils in A.D.A., accounting for 55 per cent of the variance. Further analysis indicated that this factor was associated positively with teacher-pupil ratios, and negatively with levels of state aid per pupil and teacher salaries. In the 1961 analysis, the dominant determinant of levels of per pupil education expenditures was the teacher salary index, explaining 67 per cent of the variance. Further analysis showed that this factor was associated positively with enrolments beyond statutory leaving ages and state aid levels, and negatively with school and school district size, and teacher-pupil ratios. In general two factors, number of schools per 5000 pupils in A.D.A. and teacher salary index, together accounted for between 55 and 80 per cent of the variance in levels of per pupil education expenditures throughout the 1941-61 period.

Inter-provincial comparisons of the Policy or Political determinants of education expenditures per pupil produced the following findings:

British Columbia/Ontario. These two provinces constitute the higher per pupil education expenditure provinces in the overall period. They are characterized by higher levels of teacher salaries, larger schools, higher than average amounts of state aid per pupil, and more teachers per 100 pupils. British Columbia is further distinguished by higher levels of enrolments beyond statutory leaving ages and larger school districts. With respect to these two factors, Ontario exhibits a pattern counter to that of British Columbia.

The Prairies. The three Prairie provinces of Alberta, Saskatchewan, and Manitoba, are marked by higher than average per pupil education expenditure levels. Each of these provinces is characterized by higher pupil-teacher ratios, generally larger school districts, higher than average teacher salary levels, and higher than average proportions of enrolments beyond statutory leaving ages. Alberta and Saskatchewan are further marked by above average levels of state aid per pupil, whereas Manitoba exhibits below average levels on this factor. Saskatchewan and Manitoba are further distinguished by smaller schools, whereas Alberta has larger than average school sizes.

Quebec. With lower than average per pupil education expenditure levels, Quebec is characterized by larger schools, lower proportions of enrolments beyond statutory leaving age, lower average teacher salaries, and lower levels of state aid per pupil. Quebec is further distinguished by higher pupil-teacher ratios and larger than average school district sizes.

The Atlantic. The four Atlantic provinces of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland, are lower per pupil expenditure provinces. Each of these provinces is characterized by smaller schools, lower teacher salary levels, and fewer enrolments beyond statutory leaving age. New Brunswick and Prince Edward Island are further marked by smaller school district sizes and higher pupil-teacher ratios. Newfoundland and Nova Scotia exhibit counter patterns for these two factors. With the exception of Newfoundland, each of the Atlantic provinces is marked by lower levels of state aid per pupil.

SUGGESTIONS FOR FURTHER RESEARCH

The analyses of this study have treated the individual provinces as singular communities, utilizing a macroscopic approach which ignores the wide variations in intra-provincial levels of the factors studied. Since this approach has produced a number of related determinants of levels of per pupil education expenditures at the inter-provincial level, it would be particularly fruitful to apply similar analyses to intra-provincial variations in levels of per pupil education expenditures. Ideally, an analysis of each of the ten Canadian provinces at the school district level would afford an excellent fund of knowledge for provincial Departments of Education, particularly with regard to the formation of viable bases upon which to construct state aid formulas. In addition, the refinement and further use of factor analytic statistical procedures in studies of education expenditure determinants is an interesting, and largely ignored, area for further research.

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APPENDIX A

SUPPLEMENTARY TABLES

TABLE XXXV

MATRICES OF INTER-CORRELATIONS FOR X_1 AND NON-POLICY VARIABLES^a
1941, 1951, 1961

1941													
x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	
x_1	1.000	-.722	.266	.728	.463	.809	-.472	-.808	.927	-.930	-.587	-.670	-.407
x_2		1.000	-.586	-.354	-.437	-.688	.795	.513	-.550	.573	-.056	.147	.064
x_3			1.000	-.337	-.160	.326	-.849	.127	.144	-.160	.139	-.078	.523
x_4				1.000	.626	.658	.007	-.831	.850	-.787	-.576	-.512	-.866
x_5					1.000	.652	-.168	-.475	.495	-.369	-.074	-.149	-.662
x_6						1.000	-.459	-.561	.812	-.808	-.477	-.638	-.393
x_7							1.000	.106	-.355	.265	-.124	.071	-.117
x_8								1.000	-.810	.800	.498	.470	.586
x_9									1.000	-.943	-.674	-.689	-.612
x_{10}										1.000	.658	.690	.418
x_{11}											1.000	.945	.420
x_{12}												1.000	.309
x_{13}													1.000

— indicates significance at the 0.05 level or better.

TABLE XXXV (CONTINUED)

1951												
X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}
X_1	1.000	-.723	.283	.676	.505	.760	-.874	.969	-.791	-.633	-.695	-.330
X_2		1.000	-.529	-.409	-.406	-.693	.660	-.737	.610	.382	.402	.021
X_3			1.000	-.244	-.002	.474	-.911	.335	-.146	.199	.036	.407
X_4				1.000	.768	.634	-.838	.657	-.716	-.509	-.434	-.844
X_5					1.000	.607	-.179	.394	-.330	.040	.045	-.799
X_6						1.000	-.574	.752	-.807	-.409	-.501	-.374
X_7							1.000	-.500	.272	-.081	.079	-.122
X_8								1.000	.763	.674	.717	.653
X_9									1.000	-.678	-.711	-.249
X_{10}										1.000	.819	.318
X_{11}											1.000	.104
X_{12}												1.000
X_{13}												

— indicates significance at the 0.05 level or better.

TABLE XXXV (CONTINUED)

1961													
X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	
X ₁	1.000	-.790	-.031	.753	.691	.756	-.427	-.819	.934	-.796	-.486	-.544	-.089
X ₂		1.000	-.168	-.403	-.449	-.715	.565	.423	-.709	.667	.127	.260	-.276
X ₃			1.000	-.410	-.073	.098	-.751	.341	-.067	.197	.423	.297	.412
X ₄				1.000	.897	.590	-.041	-.934	.869	-.622	-.460	-.430	-.647
X ₅					1.000	.624	-.269	-.796	.807	-.415	-.165	-.166	-.652
X ₆						1.000	-.608	-.515	.789	-.758	-.324	-.418	-.157
X ₇							1.000	.145	-.422	.239	-.136	.008	-.180
X ₈								1.000	-.868	.588	.492	.465	.538
X ₉									1.000	-.816	-.484	-.532	-.282
X ₁₀										1.000	.679	.754	-.052
X ₁₁											1.000	.980	.198
X ₁₂												1.000	.091
X ₁₃													1.000

_____ indicates significance at the 0.05 level or better.

^aFor details of variables refer to Table II, p. 92.

TABLE XXXVI

MATRICES OF INTER-CORRELATIONS FOR X_1 AND POLICY VARIABLES^a
1941, 1951, 1961

1941							
	X_1	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}
X_1	1.000	<u>.647</u>	-.422	-.630	.030	-.611	.152
X_{14}		1.000	.182	-.213	-.121	-.484	.539
X_{15}			1.000	.491	.066	.534	.117
X_{16}				1.000	-.593	.174	-.141
X_{17}					1.000	.584	.061
X_{18}						1.000	-.333
X_{19}							1.000
1951							
X_1	1.000	.631	.112	<u>-.739</u>	.497	-.622	.597
X_{14}		1.000	.073	-.376	.452	<u>-.664</u>	.418
X_{15}			1.000	.420	-.175	.375	-.315
X_{16}				1.000	-.619	.470	-.628
X_{17}					1.000	-.365	<u>.776</u>
X_{18}						1.000	<u>-.702</u>
X_{19}							1.000
1961							
X_1	1.000	<u>.639</u>	.084	<u>-.645</u>	.323	<u>-.817</u>	<u>.725</u>
X_{14}		1.000	.252	-.107	-.074	-.591	<u>.814</u>
X_{15}			1.000	.327	-.184	.047	-.137
X_{16}				1.000	-.535	.331	-.428
X_{17}					1.000	-.271	.173
X_{18}						1.000	-.658
X_{19}							1.000

— indicates significance at the 0.05 level or better.

^aFor details of variables refer to Table II, p. 92.

TABLE XXXVII

VARIANCE (F) RATIOS, DEGREES OF FREEDOM, AND LEVELS OF
SIGNIFICANCE ASSOCIATED WITH THE ADDITION OF NON-
POLICY INDEPENDENT VARIABLES IN THE STEPWISE
MULTIPLE REGRESSION EQUATIONS RELATING TO
LEVELS OF THE DEPENDENT VARIABLE X_1^a
1941, 1951, 1961

Independent Variables ^a	Degrees of Freedom	F Ratios	Levels of Significance
1941			
X_{10}	1,8	50.89	.0002
X_7	2,7	39.72	.0004
X_8	3,6	32.73	.0009
X_{12}	4,5	27.00	.0024
X_3	5,4	21.20	.0078
X_4	6,3	37.99	.0107
X_5	7,2	03.02	.0208
X_{13}	8,1	65.48	.1286
1951			
X_9	1,8	101.04	.0001
X_8	2,7	68.93	.0001
X_{10}	3,6	54.19	.0004
X_2	4,5	45.29	.0011
X_4	5,4	43.66	.0030
X_5	6,3	60.35	.0071
X_3	7,2	793.66	.0095
X_7	8,1	-- --	.0600
1961			
X_9	1,8	54.64	.0002
X_{13}	2,7	33.52	.0006
X_8	3,6	27.40	.0012
X_6	4,5	25.16	.0027
X_5	5,4	21.57	.0077
X_{11}	6,3	49.38	.0084
X_{10}	7,2	166.27	.0165
X_7	8,1	-- --	.0545

^aFor details of variables refer to Table II, p. 92.

TABLE XXXVIII

VARIANCE (F) RATIOS, DEGREES OF FREEDOM, AND LEVELS OF
SIGNIFICANCE ASSOCIATED WITH THE ADDITION OF POLICY
INDEPENDENT VARIABLES IN THE STEPWISE MULTIPLE
REGRESSION EQUATIONS RELATING TO LEVELS OF
THE DEPENDENT VARIABLE X_1^a
1941, 1951, 1961

Independent Variables ^a	Degrees of Freedom	F Ratios	Levels of Significance
1941			
X_{14}	1,8	9.61	.0143
X_{15}	2,7	11.26	.0069
X_{16}	3,6	33.41	.0008
X_{19}	4,5	22.60	.0033
X_{18}	5,4	14.79	.0134
X_{17}	6,3	9.76	.0485
1951			
X_{16}	1,8	5.77	.0415
X_{15}	2,7	9.02	.0119
X_{18}	3,6	7.02	.0224
X_{17}	4,5	6.24	.0361
X_{14}	5,4	4.43	.0884
X_{19}	6,3	3.02	.1955
1961			
X_{18}	1,8	16.06	.0042
X_{16}	2,7	16.49	.0028
X_{15}	3,6	17.44	.0031
X_{14}	4,5	15.04	.0068
X_{17}	5,4	10.00	.0247
X_{19}	6,3	6.35	.0818

^aFor details of variables refer to Table II, p. 92.

TABLE XXXIX

VARIANCE (F) RATIOS, DEGREES OF FREEDOM, AND LEVELS OF SIGNIFICANCE ASSOCIATED WITH THE ADDITION OF FOUR NON-POLICY INDEPENDENT VARIABLES IN THE STEPWISE MULTIPLE REGRESSION EQUATIONS RELATING TO LEVELS OF THE DEPENDENT VARIABLE X_1^a 1941, 1951, 1961

Independent Variables ^a	Degrees of Freedom	F Ratios	Levels of Significance
1941			
X_9	1,4	48.63	.0003
X_{13}	2,3	31.38	.0006
X_8	3,2	22.77	.0018
X_7	4,1	17.12	.0053
1951			
X_9	1,4	101.04	.0001
X_8	2,3	68.93	.0001
X_{13}	3,2	46.34	.0005
X_7	4,1	32.77	.0018
1961			
X_9	1,4	54.64	.0002
X_{13}	2,3	33.52	.0006
X_8	3,2	27.40	.0012
X_7	4,1	17.48	.0051

^aFor details of variables refer to Table II, p. 92.

TABLE XL

VARIANCE (F) RATIOS, DEGREES OF FREEDOM, AND LEVELS OF
SIGNIFICANCE ASSOCIATED WITH THE ADDITION OF THREE
POLICY INDEPENDENT VARIABLES IN THE STEPWISE
MULTIPLE REGRESSION EQUATIONS RELATING TO LEVELS
OF THE DEPENDENT VARIABLE X_1^a
1941, 1951, 1961

Independent Variables ^a	Degrees of Freedom	F Ratios	Levels of Significance
1941			
X_{16}	1,4	5.26	.0493
X_{18}	2,3	6.68	.0238
X_{15}	3,2	4.29	.0615
1951			
X_{16}	1,4	16.06	.0042
X_{15}	2,3	16.49	.0028
X_{18}	3,2	17.44	.0031
1961			
X_{18}	1,4	9.61	.0143
X_{16}	2,3	11.26	.0069
X_{15}	3,2	33.41	.0008

^aFor details of variables refer to Table II, p. 92.

TABLE XLI

CURRENT PROVINCIAL GOVERNMENT EXPENDITURES^a
FOR PUBLIC ELEMENTARY AND SECONDARY EDUCATION,
BY PROVINCES, AND TOTAL FOR CANADA
1941, 1951, 1961

(Thousands of Current Dollars)

Province	1941 ^b	1951	1961
Newfoundland	786	1342	1723
Prince Edward Island	72	175	308
Nova Scotia	602	1983	4890
New Brunswick	311	891	1649
Quebec	6860	16645	55594
Ontario	4305	7747	33911
Manitoba	788	1042	2899
Saskatchewan	887	1079	4287
Alberta	1025	632	2748
British Columbia	655	4439	6820
Canada	16291	35975	114831

^a

"Current Provincial Government Expenditures" are Total Provincial Government Expenditures less grants to school boards.

^b

All 1941 data are estimated.

Expenditure data: The data for each province for 1941 were estimated from: D.B.S., *Financial Statistics of Provincial Governments in Canada, 1941* (Ottawa: King's Printer, 1945), Table 3, used in conjunction with: Government of Newfoundland, *Department of Education Annual Report, 1942*, Table 5; Province of Prince Edward Island, *Annual Report of the Department of Education, 1941*, Table G; Province of Nova Scotia, *Annual Report of the Superintendent of Education, 1941 and 1942*, Table 5; Province of New Brunswick, *Annual Report of the Department of Education, 1941 and 1942*, Table 21; Province of Quebec, *Report of the Superintendent of Education, 1940-41 and 1941-42*, Table VI; Province of Ontario, *Report of the Minister of Education, 1941*, Table 4; Province of Manitoba, *Report of the Department of Education, 1945*, Table 6; Province of Saskatchewan, *Annual Report of the Department of Education, 1941*, Part II; Province of Alberta, *Annual Report of the Department of Education, 1941*, Table 25; Province of British Columbia, *Annual Report of the Public Schools, 1940-41 and 1941-42*, Section B. The data for each province for 1951 and 1961 were calculated from: D.B.S., *Survey of Education Finance 1961* (Ottawa: Queen's Printer, 1964), Tables 11, 12, and 13.

TABLE XLII

CURRENT SCHOOL BOARD EXPENDITURES^a FOR PUBLIC
ELEMENTARY AND SECONDARY EDUCATION, BY PROVINCES, AND TOTAL
FOR CANADA
1941, 1951, 1961
(Thousands of Current Dollars)

Province	1941	1951	1961
Newfoundland	524	3831	14722
Prince Edward Island	435	1120	3231
Nova Scotia	3713 ^b	10441 ^b	32571
New Brunswick	3276 ^b	10534 ^b	25254
Quebec	19949	56438	125181
Ontario	41609	117867	389029
Manitoba	7273	16180	50701
Saskatchewan	9615	22036	61681
Alberta	8714	27282	96764
British Columbia	9311	28468	109327
Canada	104419	294199	908461

^a"Current Expenditures" are Total Expenditures less capital outlays and debt charges.

^bCapital outlays and debt charges are estimated.

Expenditure data: The data for Newfoundland in 1941 were calculated from: Government of Newfoundland, *Department of Education Annual Report*, 1942, Table 5. The data for all other provinces in 1941 and 1951 were calculated from: D.B.S., *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1959), Table 59. The data for each province for 1961 were calculated from: D.B.S., *Survey of Education Finance, 1961* (Ottawa: Queen's Printer, 1964), Tables 9, 11, 12, and 13.

TABLE XLIII

CURRENT EXPENDITURES PER PUPIL IN AVERAGE DAILY ATTENDANCE
IN PUBLIC ELEMENTARY AND SECONDARY SCHOOLS, BY PROVINCES,
AND AVERAGE FOR CANADA^a - X_1
1941, 1951, 1961
(Constant 1957 dollars)^b

Province	1941	1951	1961
Newfoundland	65.7	96.8	125.5
Prince Edward Island	89.0	110.6	143.5
Nova Scotia	109.1	140.2	203.8
New Brunswick	114.9	172.8	174.2
Quebec	125.5	169.5	242.4
Ontario	179.5	237.0	285.6
Manitoba	168.0	195.2	268.0
Saskatchewan	154.4	217.8	303.6
Alberta	160.3	232.7	312.6
British Columbia	220.0	270.9	344.4
Canada	138.6	184.4	240.4

^aThis is an unweighted arithmetic mean.

^bCurrent dollar data were adjusted for differences in prices over time with implicit price indices for Government Expenditures on Goods and Services, 1949 = 100 converted to 1957 = 100. Calculated from: D.B.S. *National Accounts, Income and Expenditure, 1964* (Ottawa: Queen's Printer, 1965), Table 57; and D.B.S., *National Accounts, Income and Expenditure, 1926 - 1956* (Ottawa: Queen's Printer, 1962), Table 6.

Expenditure data: The data for each province, for each year, were calculated from: foregoing Tables XLI and XLII.

Attendance data: The data for each province, for each year, were calculated from: D.B.S., *Survey of Elementary and Secondary Education, 1961 - 1962* (Ottawa: Queen's Printer, 1964), Table 2-14. Data for Quebec were adjusted to exclude independent school students.

TABLE XLIV

PER CENT OF TOTAL POPULATION WITHIN STATUTORY SCHOOL-AGE LIMITS^a,
 BY PROVINCES, AND AVERAGE FOR CANADA^b
 1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	20.0	19.0	23.5
Prince Edward Island	18.0	17.3	20.7
Nova Scotia	21.1	20.8	23.8
New Brunswick	20.9	19.7	23.7
Quebec	23.4	19.5	22.1
Ontario	16.9	16.6	21.1
Manitoba	16.2	14.5	18.1
Saskatchewan	18.6	16.2	18.7
Alberta	17.4	15.4	18.3
British Columbia	12.9	12.8	17.0
Canada	18.5	17.2	20.7

^aStatutory School-age Limits were taken to be:

Newfoundland - 7 - 15 years
 Prince Edward Island - 7 - 15 years
 Nova Scotia - 6 - 16 years
 New Brunswick - 7 - 16 years
 Quebec - 6 - 15 years
 Ontario - 6 - 16 years
 Manitoba - 7 - 15 years
 Saskatchewan - 7 - 15 years
 Alberta - 7 - 15 years
 British Columbia - 7 - 15 years.

Statutory limits in Newfoundland and Manitoba, enacted in 1942 and 1949 respectively, were deemed to be in effect in 1941. In Manitoba the upper limit is actually 14 years, or permissively up to 16 years with the employment of an attendance officer by school boards. Provisions allow rural children to leave at 14 years in New Brunswick and Ontario. Each of these distinctions was ignored in computation of this variable. Statutory School-Age Limits data were taken from: D.B.S., *Survey of Elementary and Secondary Education, 1961-62* (Ottawa: Queen's Printer, 1964), p. 28.

^bThis is an unweighted arithmetic mean.

Population data: The data for each province, for 1941, 1951, and 1961 respectively were calculated from: D.B.S., *Census of Canada (1941) - Population* (Ottawa: King's Printer, 1946), Table 3; D.B.S., *Census of Canada (1951) - Population* (Ottawa: Queen's Printer, 1953), Appendix A; D.B.S., *Census of Canada (1961) - Population* (Ottawa: Queen's Printer, 1962), Table 26.

TABLE XLV

PER CENT OF POPULATION IN STATUTORY SCHOOL-AGE LIMITS^a
 ENROLLED^b IN PUBLIC SCHOOLS, BY PROVINCES,
 AND AVERAGE FOR CANADA^c, X₃
 1941, 1951, 1961

Province	1941 ^d	1951 ^e	1961
Newfoundland	86.3	89.5	95.9
Prince Edward Island	92.0	91.5	93.4
Nova Scotia	90.4	90.3	90.4
New Brunswick	85.0	84.7	92.2
Quebec ^f	69.3	74.2	79.1
Ontario	92.7	90.6	92.8
Manitoba	88.4	88.9	88.5
Saskatchewan	97.9	94.2	95.0
Alberta	97.2	94.7	96.0
British Columbia	90.0	93.1	92.4
Canada	88.9	89.2	91.6

^aSee preceding Table XLIV for definitions.

^bPupils unclassified by age were included within the school-age enrolments. The proportion was always less than 1 per cent.

^cThis is an unweighted arithmetic mean.

^dData were available for 1942 only. As individual provincial enrolments (grant totals) decreased by 1 per cent between 1940-41 and 1941-42, the 1942 data were increased by 1 per cent for each province to provide realistic estimates of 1941 figures.

^eData available for 1952 school-year only. As individual provincial enrolments increased by 6 per cent between 1950-51 and 1951-52, the 1952 data were decreased by 6 per cent for each province to provide realistic estimates of 1951 figures.

^fQuebec data in each year were decreased by 9 per cent, being the proportion of total enrolments in independent schools.

Population data: The data for each province, for 1941, 1951, and 1961, were calculated from preceding Table XLIV.

Enrolment data: The data for each province, except Newfoundland, in 1941, were calculated from: D.B.S., *Elementary and Secondary Education in Canada 1940-42* (Ottawa: King's Printer, 1944), Table 8. Data for Newfoundland for 1941 were calculated from: Government of Newfoundland, *Department of Education Annual Report, 1942*, Table 2. The data for each province for 1951 were calculated from: D.B.S., *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1959), Table 10. The data for each province for 1961 were calculated

TABLE XLVI

PER CENT OF POPULATION LIVING IN URBAN PLACES^a,
 BY PROVINCES, AND AVERAGE FOR CANADA^b, X_4
 1941, 1951, 1961

Province	1941 ^c	1951 ^d	1961 ^d
Newfoundland	13.8	19.0	25.3
Prince Edward Island	15.6	16.1	17.5
Nova Scotia	27.1	31.7	37.4
New Brunswick	22.7	23.6	30.8
Quebec	49.5	54.5	61.6
Ontario	54.2	59.5	67.2
Manitoba	43.5	43.0	48.8
Saskatchewan	15.0	19.9	31.2
Alberta	27.1	37.6	52.3
British Columbia	55.4	59.8	65.4
Canada	32.4	36.5	43.8

^aAn "urban place" is defined as any incorporated town, city, or village with a population of 10,000 or more, and all urban areas, whether incorporated or not, included in the Census Metropolitan Areas. (Metropolitan Areas, as defined for the census, relate to groups of urban communities in Canada which are in close economic, geographic, and social relationships)--D.B.S., *Census of Canada (1961) - Population* (Ottawa: Queen's Printer, 1963), Introductory Report, p. xi.

^bThis is an unweighted arithmetic mean.

^cCensus Metropolitan Areas of 1941 areas.

^dCensus Metropolitan Areas of 1961 areas.

Population data: The data for each province for 1941, with the exception of Newfoundland, were calculated from: D.B.S., *Census of Canada (1941) - Population* (Ottawa: Queen's Printer, 1946), Tables 9 and 12. The data for Newfoundland in 1941 were calculated from: D. B.S., *Newfoundland - Canada's New Province* (Ottawa: Queen's Printer, 1950), p. 50. The data for each province, for 1951 and 1961, were calculated from: D.B.S., *Census of Canada (1961) - Population* (Ottawa: Queen's Printer, 1962), Tables 9 and 10.

(Footnote continuation from previous page)

from: D.B.S., *Survey of Elementary and Secondary Education, 1960-61* (Ottawa: Queen's Printer, 1963) and D.B.S., *Survey of Elementary and Secondary Education, 1961-62* (Ottawa: Queen's Printer, 1964), Table 1-03.

TABLE XLVII
 INDEX OF MIGRATION^a, BY PROVINCES
 AND AVERAGE FOR CANADA^b, X₅
 1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	47.7	67.2	86.9
Prince Edward Island	77.9	21.4	35.2
Nova Scotia	108.5	62.4	73.6
New Brunswick	79.3	58.4	68.8
Quebec	92.4	98.2	120.6
Ontario	110.6	160.4	171.9
Manitoba	33.3	43.5	96.9
Saskatchewan	-17.2	-47.6	54.2
Alberta	59.2	95.4	147.9
British Columbia	257.5	298.1	207.3
Canada	84.9	85.7	106.3

^aThe "Index of Migration" is constructed as the actual increase in population as a per cent of natural increase in population by taking ten-year data in 1931-1941, 1941-1951, and 1951-1961, and averaging for the single years of 1941, 1951, and 1961. The resulting figures may be read as, for every 100 increase by natural increase in the population the above proportions remain in the province.

^bThis is an unweighted arithmetic mean.

Natural and Actual Increase Data: The data for each province, with the exception of Newfoundland in 1941, for each year were calculated from: D.B.S., *Canada Year Book*, 1963-64 (Ottawa: Queen's Printer, 1964), Tables 1 and 20. The data for Newfoundland in 1941 were calculated from: Newfoundland Department of Health, *Report on the Births, Marriages, and Deaths in the Province of Newfoundland for the Year 1964* (St. Johns, 1965), Table 1.

TABLE XLVIII

PER CENT OF POPULATION WITH NINE OR MORE YEARS
OF FORMAL EDUCATION^a, BY PROVINCES,
AND AVERAGE FOR CANADA^b, X₆

Province	1941	1951	1961
Newfoundland	10.8 ^c	16.8	22.1
Prince Edward Island	26.0	28.3	30.5
Nova Scotia	29.2	31.6	34.4
New Brunswick	21.1	22.8	24.4
Quebec	21.3	23.4	26.6
Ontario	32.6	35.7	35.1
Manitoba	28.6	31.7	35.0
Saskatchewan	22.1	27.0	30.1
Alberta	28.6	33.8	35.6
British Columbia	38.8	41.7	41.9
Canada	25.9	29.3	31.6

^aThe data refer to the non-school population. The following comments should be noted: "It is difficult to make accurate comparisons of 1961 and 1951 [1941] data on schooling because of: (a) difference in concepts in 1951 [1941] and 1961. - In 1951 [1941] 'number of years attended', and 1961 'highest grade attended' - (b) differences in particular schooling groups tabulated in 1951 [1941] and 1961. If a comparison is to be made, the difference in concept would have to be ignored [may not be too serious]. . ." from: *Mimeo* to the author from D.B.S. Census Division, March, 1966.

^bThis is an unweighted arithmetic mean.

^cThis is 1945 data - no data prior to this date.

Schooling data: The data for each province, with the exception of Newfoundland in 1941, for 1941, 1951, and 1961 respectively were calculated from: D.B.S., *Census of Canada (1941) - Population* (Ottawa: King's Printer, 1946), Tables 55 and 56; D.B.S., *Census of Canada (1951) - Population* (Ottawa: Queen's Printer, 1953), Table 28; and D.B.S., *Census of Canada (1961) - Population* (Ottawa: Queen's Printer, 1962), Table 99. The data for Newfoundland in 1945 were calculated from: Government of Newfoundland, *Census of Newfoundland and Labrador, 1945* (D.B.S., 1949), Volume 1, Table 40.

TABLE XLIX

PER CENT OF POPULATION ROMAN CATHOLIC,
BY PROVINCES, AND AVERAGE FOR CANADA^a, X₇
1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	32.7 ^b	33.6	35.7
Prince Edward Island	45.0	45.5	46.1
Nova Scotia	32.7	33.9	35.3
New Brunswick	48.1	50.6	52.0
Quebec	86.9	87.9	88.1
Ontario	23.3	24.8	30.0
Manitoba	27.9	20.1	22.9
Saskatchewan	27.2	24.0	26.5
Alberta	24.0	19.8	22.4
British Columbia	13.9	14.4	17.5
Canada	43.1	43.3	45.8

^aThis is an unweighted arithmetic average.

^bEstimated.

Denominational data: The data for each province (with the exception of Newfoundland in 1941), for 1941, 1951, and 1961, were calculated from, respectively: D.B.S., *Census of Canada (1941) - Population* (Ottawa: King's Printer, 1946), Table 15; D.B.S., *Census of Canada (1951) - Population* (Ottawa: Queen's Printer, 1953), Table 38; and D.B.S., *Census of Canada (1961) - Population* (Ottawa: Queen's Printer, 1962), Table 42. The data for Newfoundland in 1941 were estimated from: Government of Newfoundland, *Census of Newfoundland and Labrador, 1945* (D.B.S., 1949), Volume 1, Table 18.

TABLE L
WAGE-EARNERS' INCOME DISTRIBUTION INDEX^a,
BY PROVINCES, AND AVERAGE FOR CANADA^b, $\bar{x}_8$
1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	92.1 ^d	67.5	62.4
Prince Edward Island	89.8	67.4	69.3
Nova Scotia	98.1	57.2	59.1
New Brunswick	80.1	52.4	61.3
Quebec	74.0	51.6	53.2
Ontario	65.9	46.0	51.7
Manitoba	75.6	51.5	54.5
Saskatchewan	86.5	57.0	57.8
Alberta	76.1	51.1	54.8
British Columbia	65.2	46.3	52.6
Canada	80.3	54.8	57.7

^aWage-Earners Income Distribution Index is constructed as the coefficient of variation for provincial income distributions of all wage-earners reporting earnings in each of the three census years, noting that the income distributions given in the census reports vary as follows: 1941, \$0 to \$2950; 1951, \$0 to \$3000; and 1961, \$0 to \$6000.

^bThis is an unweighted average.

^cAll 1941 data are exclusive of persons on Active Service on June 2, 1941.

^dEstimated.

Income data: The data for each province (with the exception of Newfoundland in 1941), for 1941, 1951, and 1961, were calculated from, respectively: D.B.S., *Census of Canada (1941) - General Review* (Ottawa: King's Printer, 1946), Table III, p. 349; D.B.S., *Census of Canada (1951) - Labour Force* (Ottawa: Queen's Printer, 1953), Table 14; and D.B.S., *Census of Canada (1961) - Labour Force* (Ottawa: Queen's Printer, 1964), Table 28. The data for Newfoundland in 1941 were estimated using the Maritime Provinces' rates-of-change between 1941 and 1951 as a guide.

TABLE LI
 PERSONAL INCOME PER CAPITA, BY PROVINCES,
 AND AVERAGE FOR CANADA^a, $\bar{X}_9$
 $\bar{1941}$, $\bar{1951}$, $\bar{1961}$ ^b
 (Constant 1957 Dollars^c)

Province	$\bar{1941}$	$\bar{1951}$	$\bar{1961}$
Newfoundland	381.5 ^d	618.8	869.9
Prince Edward Island	467.1	700.6	941.5
Nova Scotia	739.3	877.8	1135.7
New Brunswick	606.9	819.5	1011.3
Quebec	814.7	1031.3	1302.5
Ontario	1204.7	1464.1	1752.1
Manitoba	884.6	1228.6	1489.2
Saskatchewan	766.9	1349.7	1378.8
Alberta	888.3	1375.5	1524.9
British Columbia	1143.3	1485.4	1723.8
Canada	789.7	1095.1	1313.0

^aThis is an unweighted arithmetic mean.

^bThree-year averages, centred on the year with a bar.

^cCurrent dollar data were adjusted for differences in prices over time with implicit price indexes for Personal Expenditure on Consumer Goods and Services, 1949 = 100 converted to 1957 = 100. Three-year averages of indexes, centred on the year with a bar. Calculated from: D.B.S., *National Accounts, Income and Expenditure*, 1964 - Table 57, 1926-56 - Table 6.

^dEstimated.

Income data: The data for each province for each year were calculated from: D.B.S., *National Accounts, Income and Expenditure*, 1964, 1926-56, Table 28.

TABLE LII

NUMBER OF DEPENDENTS^a PER 100 ACTUAL WORK FORCE MEMBERS^b,
 BY PROVINCES, AND AVERAGE FOR CANADA^b, $\bar{X}_{10}$
 1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	235 ^d	240	302
Prince Edward Island	206	189	205
Nova Scotia	203	191	207
New Brunswick	213	206	233
Quebec	182	176	195
Ontario	161	144	159
Manitoba	175	161	168
Saskatchewan	184	176	183
Alberta	177	166	171
British Columbia	161	163	180
Canada	190	181	200

^a"Dependents" are all persons other than those in the Actual Work Force (see following note).

^bThe "Actual Work Force" is synonymous with the D.B.S. definition of "Labour Force" (see, D.B.S., *The Labour Force* [Ottawa: Queen's Printer, 1960], pp. 2-3) which, in brief, is the sum of all persons 15 years of age and over in the population at a given time who are employed or unemployed.

^cThis is an unweighted arithmetic average.

^dEstimated.

Population data: The data for each province for each year were calculated from: D.B.S., *Census of Canada (1961) - Population* (Ottawa: Queen's Printer, 1963), Table 6.

Work Force data: The data for each province (with the exception of Newfoundland in 1941) for each year were calculated from: D.B.S., *Census of Canada (1961) - Labour Force* (Ottawa: Queen's Printer, 1964), Table 2. The data for Newfoundland for 1941 were estimated from: Government of Newfoundland, *Census of Newfoundland and Labrador, 1945* (D.B.S., 1949), Volume I, Table 43.

TABLE LIII

PER CENT OF SCHOOL BOARD REVENUES^a FROM PROVINCIAL SOURCES^b,
 BY PROVINCES, AND AVERAGE FOR CANADA^c, $\bar{X}_{11}$
 1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	73.0	76.5	86.9
Prince Edward Island	60.1	49.9	62.1
Nova Scotia	19.3	51.4	43.1
New Brunswick	17.5	45.1	31.4
Quebec	10.2	23.0	40.1
Ontario	15.0	33.1	37.1
Manitoba	14.7	23.3	41.1
Saskatchewan	25.8	29.1	42.5
Alberta	17.6	29.9	54.1
British Columbia	29.9	43.4	46.9
Canada	28.3	40.5	48.5

^aThose current revenues consisting of local municipal taxation, general and special grants from the province, fees, and incidental amounts from other sources such as donations, and rentals of classrooms. Capital outlays may be paid for from current revenue. From: D.B.S., *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1959), p. 125.

^bProvincial grants to school boards and teachers of the elementary and secondary schools, both academic and vocational. School board revenue from counties is not included. From: D.B.S., *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1959), p. 125.

^cThis is an unweighted arithmetic average.

Revenue and Grants data: The data for each province (with the exception of Newfoundland in 1941) for each year were calculated from: D.B.S., *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1959), Table 58; and D.B.S., *Survey of Education Finance* (Ottawa: Queen's Printer, 1964), Table 9. The data for Newfoundland in 1941 were calculated from: Government of Newfoundland, *Department of Education Annual Report, 1942*, Table 2.

TABLE LIV

PER CENT OF NON-PROPERTY TAX REVENUES^a OF TOTAL REVENUES^b
FOR PUBLIC ELEMENTARY AND SECONDARY EDUCATION,
BY PROVINCES, AND AVERAGE FOR CANADA^c, $\bar{X}_{12}$
1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	100	100	99
Prince Edward Island	67	64	67
Nova Scotia	29	58	52
New Brunswick	25	48	38
Quebec	37	41	53
Ontario	28	42	44
Manitoba	24	29	44
Saskatchewan	34	35	48
Alberta	32	34	56
British Columbia	34	52	53
Canada	41	50.3	55.4

^aNon-property tax revenues are all revenues other than those from local property taxation for schools. Revenues from counties, applicable to Nova Scotia, New Brunswick and Ontario prior to 1961, are included in local property taxation.

^bTotal Revenues include school board current revenues and apparent provincial revenues - that is, provincial expenditures less grants to school boards.

^cThis is an unweighted arithmetic average.

Property Tax Revenues: The data for each province for each year were calculated from: D.B.S., *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1964), Table 58; and, D.B.S., *Survey of Education Finance, 1961* (Ottawa: Queen's Printer, 1964), Table 9.

Total Revenues: The data for school board revenues, for 1941, 1951, and 1961, were calculated from: *Ibid.* The data for apparent provincial revenues were calculated from the sources listed in Table XLI of Appendix B.

TABLE LV
PER CENT OF LABOUR FORCE^a IN PRIMARY INDUSTRIES^b,
BY PROVINCES, AND AVERAGE FOR CANADA^c, X₁₃
1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	43.7 ^d	31.4	15.7
Prince Edward Island	59.0	44.3	33.2
Nova Scotia	35.4	22.8	12.8
New Brunswick	40.3	27.6	14.7
Quebec	25.2	16.6	10.1
Ontario	21.5	12.8	8.8
Manitoba	37.9	26.3	18.9
Saskatchewan	60.7	49.7	37.9
Alberta	52.9	35.2	22.9
British Columbia	24.0	13.2	8.2
Canada	40.1	28.0	18.3

^aThis is the sum of all persons at a given time who are employed or seeking employment. For precise definitions see: D.B.S., *Labour Force* (Ottawa: Queen's Printer, 1960), pp. 2 - 3.

^b"Primary Industries" are construed as agriculture, hunting, fishing, trapping, logging, mining, and quarrying.

^cThis is an unweighted arithmetic average.

^dEstimated.

Labour Force data: The data for each province for each year (with the exception of Newfoundland in 1941) were calculated from: D.B.S., *Census of Canada (1961) - Labour Force* (Ottawa: Queen's Printer, 1964), Table 2. The data for Newfoundland in 1941 were estimated from: Government of Newfoundland, *Census of Newfoundland and Labrador, 1945* (D.B.S., 1949), Volume 1, Table 43.

Primary Industries data: The data for each province were calculated from: D.B.S., *Census of Canada (1961) - Labour Force* (Ottawa: Queen's Printer, 1964), Table 3.

TABLE LVI

PER CENT OF TOTAL ENROLMENTS^a BEYOND STATUTORY LEAVING AGES^b
 BY PROVINCES, AND AVERAGE FOR CANADA^c, X_{14}
 1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	6.7	6.4	7.9
Prince Edward Island	5.5	6.0	8.3
Nova Scotia	4.6	4.6	4.2
New Brunswick	3.5	4.0	5.3
Quebec	4.1	4.1	7.4
Ontario	4.1	5.1	6.5
Manitoba	11.6	10.1	12.3
Saskatchewan	12.6	10.7	12.3
Alberta	13.9	12.4	12.4
British Columbia	16.1	12.9	12.2
Canada	8.3	7.6	8.9

^aTotal Enrolments in public elementary and secondary schools regardless of age.

^bFor details of ages and sources of data see Table XLIV, Foot-note a.

^cThis is an unweighted arithmetic average.

Enrolment data: For details and sources refer to source footnotes of Table XLV, p. 259.

TABLE LVII

NUMBER OF TEACHERS^a PER 100 PUPILS IN AVERAGE DAILY ATTENDANCE^b
 IN PUBLIC ELEMENTARY AND SECONDARY SCHOOLS,
 BY PROVINCES, AND AVERAGE FOR CANADA^c, X₁₅
 1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	4.4	3.6	3.7
Prince Edward Island	5.1	4.8	4.4
Nova Scotia	3.8	3.9	4.0
New Brunswick	4.0	4.6	4.3
Quebec	4.9	5.0	4.6
Ontario	2.0	3.9	3.7
Manitoba	4.1	4.4	4.3
Saskatchewan	4.7	5.2	4.5
Alberta	4.3	4.3	4.2
British Columbia	4.0	4.2	4.0
Canada	4.1	4.4	4.2

^aMen and women teaching in the publicly-controlled schools of all provinces. Included are all full-time teachers - regular classroom teachers, special teachers and supervisors of special subjects or work. Inspectors and school superintendents are not included. Data for Quebec do not include teachers in the independent schools.

^bData for Quebec do not include independent school pupils.

^cThis is an unweighted arithmetic average.

Teacher data: The data for each province for each year were calculated from: D.B.S., *Salaries and Qualifications of Teachers in Public Elementary and Secondary Schools*, 1954-55 and 1962-63, Table I.

Attendance data: The data for each province, for 1941, 1951, and 1961, were calculated from: D.B.S., *Survey of Elementary and Secondary Education*, 1961-62 (Ottawa: Queen's Printer, 1964), Table 2-14.

TABLE LVIII

NUMBER OF SCHOOLS^a PER 5,000 PUPILS IN AVERAGE DAILY ATTENDANCE
IN PUBLIC ELEMENTARY AND SECONDARY SCHOOLS,
BY PROVINCES, AND AVERAGE FOR CANADA^b, $\bar{X}_{16}$
1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	130	83	52
Prince Edward Island	185	148	100
Nova Scotia	191	82	38
New Brunswick	148	88	47
Quebec	96	80	33
Ontario	64	52	28
Manitoba	96	81 ^c	46
Saskatchewan	190 ^c	90 ^c	58
Alberta	132	68	21
British Columbia	57	32	21
Canada	128.9 ^c	80.4 ^c	44.4

^aIncludes all denominational and non-denominational schools under provincial control and supervision.

^bThis is an unweighted arithmetic average.

^cEstimated.

Schools data: The data for each province for 1961 were calculated from: D.B.S., *Survey of Elementary and Secondary Education*, 1960-61 and 1961-62, Table 2-02. The data for each province for 1941 and 1951 were calculated from: Provincial Governments, *Department of Education Annual Reports*, 1940-41, 1941-42, 1950-51, and 1951-52.

Attendance data: The data for each province, for 1941, 1951, and 1961, were calculated from: D.B.S., *Survey of Elementary and Secondary Education*, 1961-62 (Ottawa: Queen's Printer, 1964), Table 2-14.

TABLE LIX

AVERAGE NUMBER OF PUPILS IN AVERAGE DAILY ATTENDANCE
IN PUBLIC ELEMENTARY AND SECONDARY SCHOOLS PER
SCHOOL DISTRICT^a, BY PROVINCES, AND AVERAGE
FOR CANADA^b, $\bar{X}_{17}$
1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	149 ^c	231 ^c	384
Prince Edward Island	27	32	47
Nova Scotia	50	73 ^c	2186
New Brunswick	43	71	1501
Quebec	232	275	663
Ontario	90	167	336
Manitoba	57	66	126
Saskatchewan	32	34	491
Alberta	37	73	1199
British Columbia	147	1587	2849
Canada	86.4	260.9	978.2

^aSchool Districts are equated with School Boards. The number of school boards in a province, excluding local boards within larger units and including school districts under an official trustee or trustees, make up the number of school districts.

^bThis is an unweighted arithmetic average.

^cEstimated.

School District data: The data for each province for 1961 were calculated from: D.B.S., *Survey of Elementary and Secondary Education*, 1960-61 and 1961-62, Table 2-01. The data for each province for 1951 and 1941 were calculated from: Provincial Governments, *Department of Education Annual Reports*, 1940-41, 1941-42, 1950-51, and 1951-52.

Attendance data: The data for each province, for 1941, 1951, and 1961, were calculated from: D.B.S., *Survey of Elementary and Secondary Education*, 1961-62 (Ottawa: Queen's Printer, 1964), Table 2-14.

TABLE LX
TEACHER SALARY INDEX^a BY PROVINCES,
AND AVERAGE FOR CANADA^b, X_{18}
1941, 1951, 1961

Province	1941	1951	1961
Newfoundland	1.800	1.326	1.202
Prince Edward Island	1.615	1.277	1.006
Nova Scotia	1.450	1.098	1.004
New Brunswick	1.262	1.217	1.015
Quebec	2.481	1.737	1.165
Ontario	1.097	.999	.836
Manitoba	1.187	1.030	.882
Saskatchewan	1.348	1.128	.842
Alberta	1.311	.925	.792
British Columbia	.928	.803	.777
Canada	1.448	1.154	.952

^aRatio of the median income of family heads to average teacher salaries. A ratio less than 1.000 indicates that the average teacher salary is higher than the median income of family heads for the province. Austin D. Swanson, "A Missing Concept in Theories of School Finance," *Educational Administration Quarterly* (Vol. 1, Spring, 1965), p. 51.

^bThis is an unweighted arithmetic average.

Income data: The data for each province, for 1951 and 1961, were calculated by the D.B.S. Census Division. The data are unpublished. The median income data apply to all families in which husband OR wife is present. The data for 1941, with the exception of Newfoundland, were calculated from: D.B.S., *Census of Canada (1941) - Population* (Ottawa: King's Printer, 1946), Table 22. The income data apply to all wage-earner families in which husband AND wife are present. Since median figures were not available, the average used in 1941 is an arithmetic average. The income data for 1941 in Newfoundland were estimated.

Teacher Salary Data: The data for each province (except Quebec) for 1961 were calculated from: D.B.S., *Salaries and Qualifications of Teachers in Public Elementary and Secondary Schools, 1961-62* (Ottawa: Queen's Printer, 1963), Table 29. The data for each province, except Quebec, for 1951 were calculated from: D.B.S., *Teachers Salaries and Qualifications in Nine Provinces, 1952-53* (Ottawa: Queen's Printer, 1954), Table 9. In 1951 and 1961, salary data averages (arranged by

(Footnotes continued from previous page)

categories) were multiplied by total numbers of teachers in each category in each year in each province, to provide grand provincial annual totals. These were then divided by total numbers of provincial teachers to give final arithmetic averages. The data for Quebec, for 1951 and 1961, were calculated from: Province of Quebec, *Report of the Superintendent of Education*, 1950-51, 1951-52, 1960-61, and 1961-62. The Quebec data excludes independent schools, and the Protestant schools of Montreal in 1951 - not reported. The data for each province, with the exception of Newfoundland, in 1941, were calculated from: D.B.S., *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1959), Tables 30 and 59. In 1941 total salary payments as reported by school boards (Table 59) were divided by the relevant number of teachers (Table 30) to provide the arithmetic averages. The data for Newfoundland, for 1941, were calculated from: Government of Newfoundland, *Department of Education Annual Report*, 1942, Table 3.

TABLE LXI

STATE AID^a PER PUPIL IN AVERAGE DAILY ATTENDANCE,
 BY PROVINCES, AND AVERAGE FOR CANADA^b, $\bar{X}_{19}$
 1941, 1951, 1961
 (Constant 1957 Dollars^c)

Province	1941	1951	1961
Newfoundland	55.9	66.5	120.1
Prince Edward Island	46.7	56.5	100.5
Nova Scotia	21.0	74.5	90.6
New Brunswick	17.8	95.0	60.6
Quebec	12.7	36.9	99.0
Ontario	30.2	89.3	122.6
Manitoba	25.9	49.3	125.9
Saskatchewan	40.4	70.3	144.0
Alberta	31.5	81.0	199.6
British Columbia	66.2	149.8	174.8
Canada	34.8	76.9	123.8

^aProvincial government grants to school boards.

^bThis is an unweighted arithmetic average.

^cCurrent dollar data were adjusted for differences in prices over time with implicit price indexes for Government Expenditures on Goods and Services 1949 = 100 converted to 1957 = 100. See Footnote b, Table XLIII, p. 257, for details of sources.

State Aid data: The data for each province for 1951 and 1961 were calculated from: D.B.S., *Survey of Education Finance, 1961* (Ottawa: Queen's Printer, 1964), Table 11. The data for each province, with the exception of Newfoundland, for 1941 were calculated from: D.B.S., *Survey of Elementary and Secondary Education, 1950-54* (Ottawa: Queen's Printer, 1959), Table 58. The data for Newfoundland in 1941 were calculated from: Government of Newfoundland, *Department of Education Annual Report, 1942*, Table 2.

Attendance data: The data for each province for each year were calculated from: D.B.S., *Survey of Elementary and Secondary Education, 1961-62* (Ottawa: Queen's Printer, 1964), Table 2-14.

TABLE LXII

PERSONAL INCOME PER POTENTIAL WORK FORCE MEMBER^a,
 BY PROVINCES, AND AVERAGE FOR CANADA^b
 1941, 1951, 1961
 (Constant 1957 Dollars^c)

Province	1941	1951	1961
Newfoundland	775.4 ^d	1138.1	1669.2
Prince Edward Island	756.2	1230.8	1750.6
Nova Scotia	1186.8	1497.0	2005.8
New Brunswick	996.9	1451.3	1868.5
Quebec	1299.6	1707.9	2217.5
Ontario	1793.9	2290.1	2934.9
Manitoba	1305.4	1966.5	2549.3
Saskatchewan	1149.9	2217.5	2426.7
Alberta	1326.3	2216.9	2639.1
British Columbia	1698.1	2377.3	2943.1
Canada	1226.8	1809.3	2300.5

^aThe "potential work force" is defined as all persons between the ages of 15 and 65 inclusive.

^bThis is an unweighted arithmetic mean.

^cCurrent dollar data were adjusted for differences in prices over time with implicit price indexes for Government Expenditures on Goods and Services 1949 = 100 converted to 1957 = 100. See Footnote b, Table XLIII, p. 257, for details of sources.

^dEstimated, using the average Canadian rate-of-change between 1941 and 1951 as a guide.

Income data: The data for each province for each year were calculated from: D.B.S., *National Accounts, Income and Expenditure*, 1926-56 and 1964, Table 28.

Work Force data: The data for each province, with the exception of Newfoundland in 1941, for each year were calculated from: D.B.S., *Census of Canada - Labour Force*, 1941 - Table 5, 1951 - Table 3, 1961 - Tables 1 and 5. Newfoundland data for 1941 were estimated from: Government of Newfoundland, *Census of Newfoundland and Labrador, 1945* (D.B.S., 1949), Volume 1, Table 8.

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